RS-120 \ RS 50

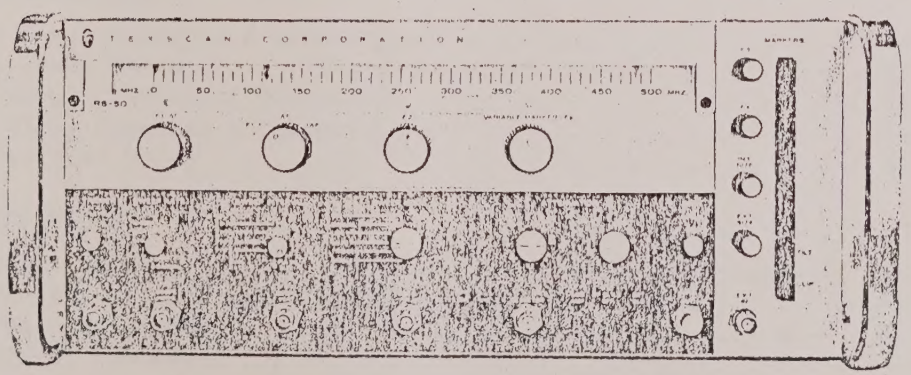
Texscan

OPERATING AND INSTRUCTION MANUAL

MODEL RS-50
SWEEP GENERATOR

MODEL RS-50

SWEEP GENERATOR



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SECTION 1

SPECIFICATIONS

1.1 Frequency Range

The RS-120 can be centered at any frequency between 1000 MHz and 2000 MHz and sweep anywhere within that range.

1.2 Frequency Dial Accuracy

The dial accuracy on all three indicators, (f_1-f_2 and M), is within 1% of the units maximum frequency.

1.3 Sweep Width

Either through adjustment of start and stop frequencies f_1 and f_2 or through adjustment of the sweep width control, the unit can sweep over any portion of its 1000 to 2000 MHz range. The minimum sweep width as limited by residual FM is approximately 50 KHz.

1.4 RF Output

The RF output is at least 0.5 volts rms into a 50 ohm load.

1.5 Flatness

The flatness is better than $\pm$0.25 db at maximum sweep width (tested with a CD-51 detector).

1.6 Harmonic Distortion and Spurious

At 0.5v rms output and from 1100 MHz to 2000 MHz all unwanted frequency components are more than 30 db below the fundamental output. At 0.5v rms output from 100 MHz to 1100 MHz, they are at least 20db below the fundamental output.

1.7 Linearity

Linearity is included within the dial accuracy specification, i.e., each indicated frequency and interpolated frequency is accurate to within 1% of the unit's maximum frequency.

1.8 Markers

Birdy Markers: The unit has a birdy-by-pass marker system with provision for up to six single frequency or harmonic markers. An external marker input is provided which can be used with a CW source to produce a variable marker. A 100 mv signal produces a marker greater than 1 volt peak-to-peak. The marker can be rectified for marking of x-y recordings.

Variable Markers: The unit also includes a pulse type variable marker which covers the frequency range of the unit. Its accuracy is the same as the unit's dial accuracy.

1.9 Sweep Modes

The unit can be operated in any one of the six sweep modes;

1) Single Sweep Mode - In this mode, the internal triangular wave generator can be swept over one cycle when energized.

2) Triggered Sweep Mode - In this mode, the time base generator can be triggered from an external source. The unit can be triggered by positive or negative DC and AC signals.

3) Automatic - In this mode, the sweep rate can be varied from 0.01 to 1000 Hz.

4) Line Rate Mode - In this mode, the unit will sweep at a fixed 50/60 Hz line rate.

5) Manual Mode - In this mode, the unit can be manually swept.

6) CW Mode - In this mode, there is no blanking or sweep width. The unit operates as a signal generator. The unit can be externally swept or phase locked in this mode of operation.

1.10 Attenuation

The unit has a 0 to 6 db vernier control of RF output and two turret attenuators which provide 0 to 70 db attenuation in 1 db steps.

1.11 Monitor

Both an internal leveling system and facility to use an external monitor are provided. If an external monitor is used, it must provide a DC signal of at least -0.5 volts for proper leveling.

1.12 RF Output Connectors

Type "N".

1.13 Horizontal Drive

A triangular waveform of approximately 10 volts peak-to-peak is provided for oscilloscope horizontal drive. The horizontal output impedance is less than 10K ohms.

1.14 Blanking Signal Output

A rectangular waveform of at least +20 volts peak is provided at a rear panel connector for external blanking of the sweep retrace.

1.15 Detection System

The unit has a built-in detector with two selectable time constants and a logarithmic amplifier. The log amp is the LN-40. The amplifier can be used to convert the detected amplitude display to a logarithmic function or it can be bypassed for normal display.

1.16 Modulation

The unit is supplied with a switchable 1 KHz, 100% amplitude modulation function.

1.17 Dual Sweep Width Feature

The unit has a feature which, on alternate cycles of swept output, sweeps over a different band than selected by the start-stop frequency dials. The second band swept is set by placing two pluse markers on the f_1- f_2 trace at the start-stop time positions of the wanted second trace.

1.18 Dual Sweep Rate Feature

The unit is provided with a feature which, when energized, will on alternate cycles sweep faster than the normal setting. This results in two displaced presentations if the circuit response is too slow for the sweep rate setting.

1.19 Size

6-7/8" x 17" 16"

1.20 Construction

Aluminum with G-10 printed circuit boards.

1.21 Weight

Approximately 34 lbs. Shipping weight is 40 lbs.

1.22 Power

Approximately 25 watts, 50/60 Hz, 115/230 volt power.

SECTION 2

GENERAL DESCRIPTION

2.1 GENERAL INFORMATION

Texscan Corporation's RS-50 is a broad sweep, variable rate, external triggered, dual sweep width, start-stop, solid state sweep signal generator. It is designed for applications within the 2 to 500 MHz frequency range.

The transistors used are all silicon, and the low frequency circuits are assembled on high-quality plug-in circuit boards for maximum reliability and serviceability.

The RS-50 covers the frequency range of 2 MHz to 500 MHz. A block diagram of the sweep system is shown in figure 2-1. The output frequency of 2 to 500 MHz is derived by taking the low level heterodyne output of two oscillators and amplifying this to 1.0V rms. Low level mixing is employed to maintain a low spurious output signal.

2.2 INTRODUCTION

As shown in figure 2-1, the RS-50 sweep generator consists of eight major sections: (1) rate circuit, (2) start-stop adder and blanking, (3) linearity, (4) leveler and log amplifier, (5) pulse marker system, (6) birdy marker system, (7) RF oscillators, mixer, video amplifier, and (8) power supply.

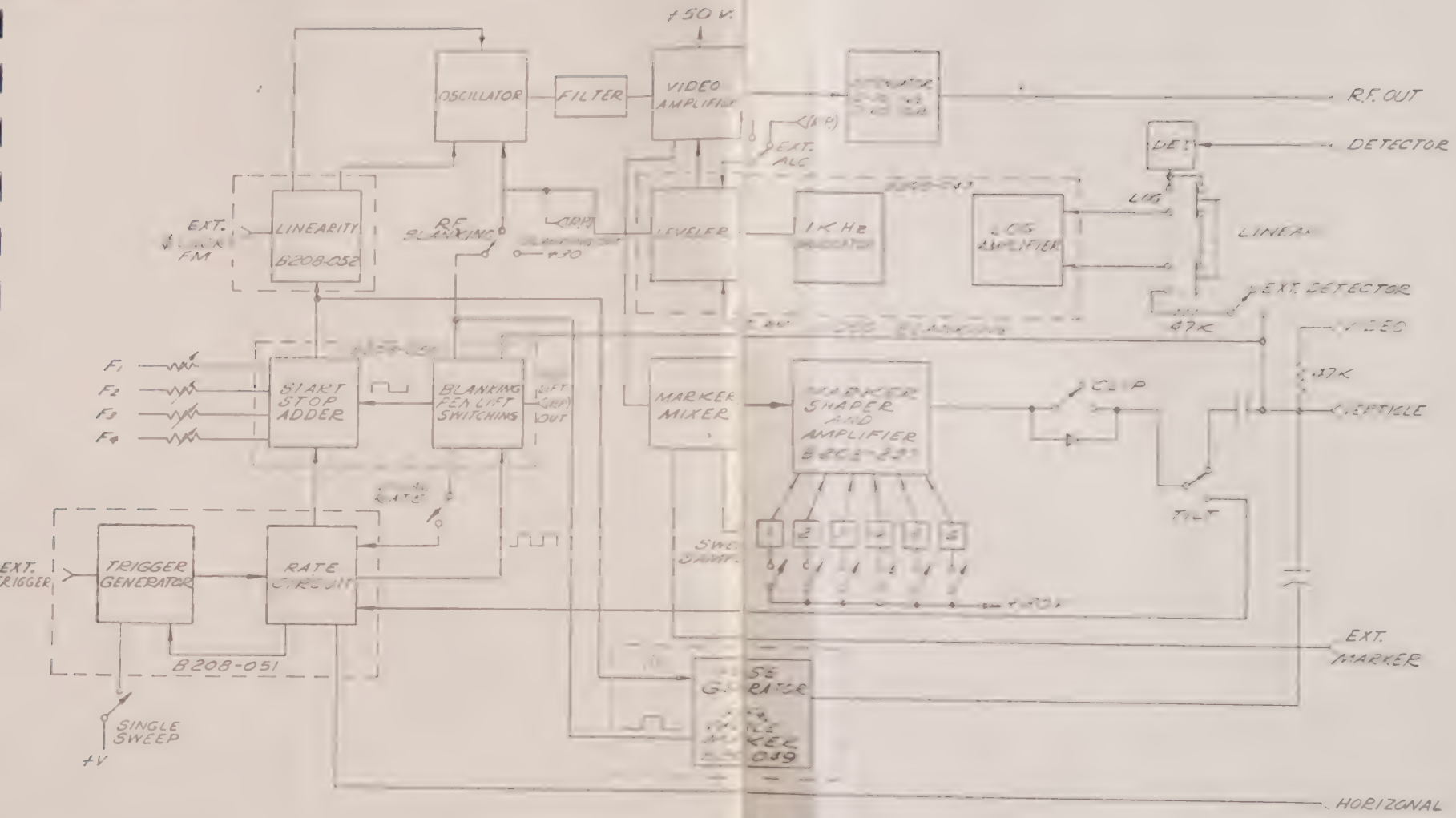
A more detailed block diagram of the time base and electronic switching is given in figure 2-2.

2.3 DESCRIPTION

The heart of the RS Series sweep signal generator is the rate circuit. This circuit provides all of the voltage waveforms necessary to operate all the functions of the unit except the RF circuitry.

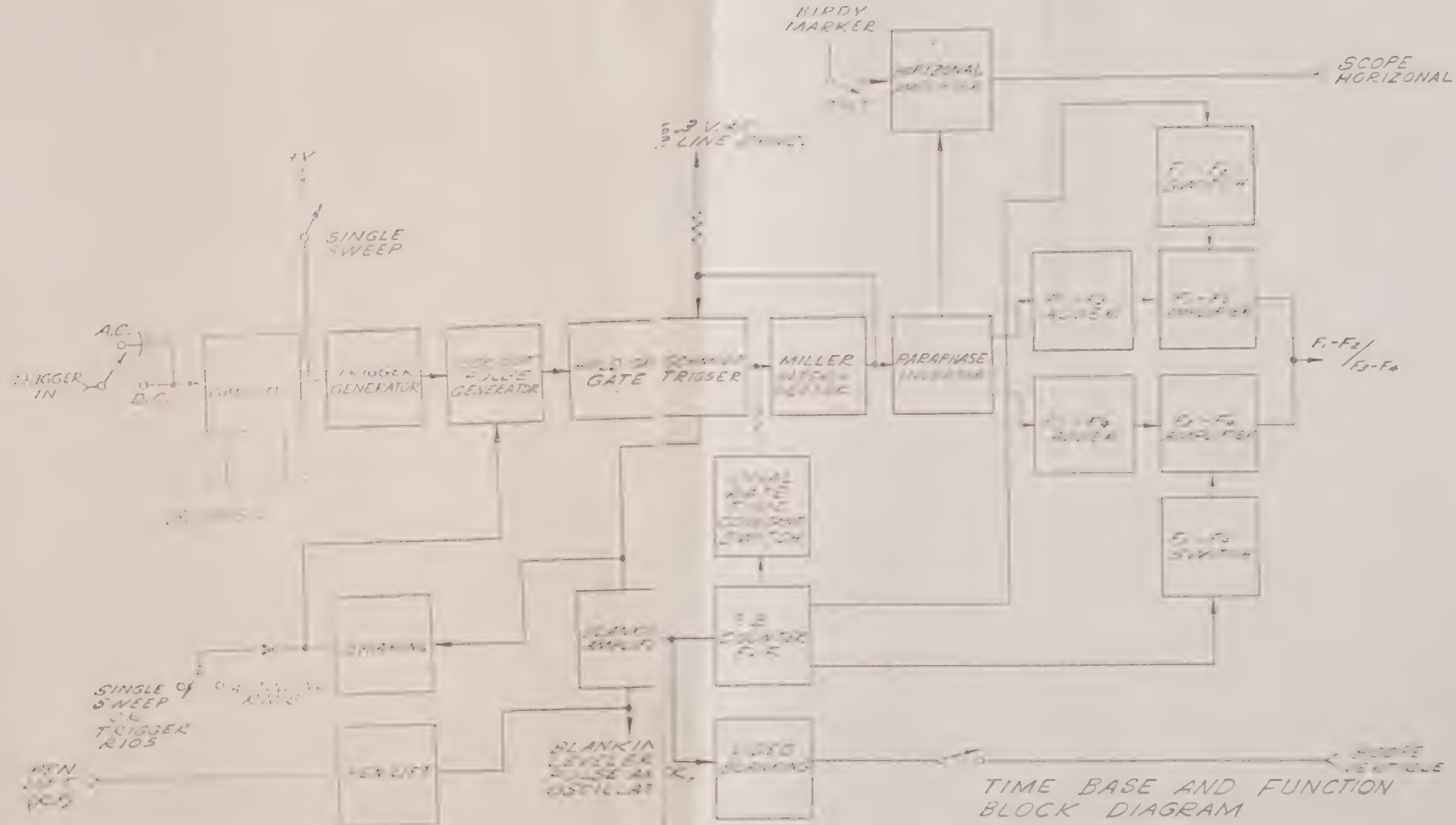
This circuit has six modes of operation as determined by the sweep mode control. The modes are: cw, manual, line, auto, trigger, and single sweep. The six modes are achieved by changing the operating characteristics of the basic rate circuit consisting of a Schmidt Trigger and Millter Integrator. See figure 2-3.

Transistors Q109 and Q110 are incorporated in the Schmidt Trigger, and Q112, Q113, and Q114 are used in the Miller Integrator. This combination of a Schmidt Trigger and Miller Integrator provides square wave and triangular



GENERAL OVERALL BLOCK DIAGRAM

FIGURE 2-1



TIME BASE AND FUNCTION BLOCK DIAGRAM

FIGURE 2-2

wave outputs with a fixed phase relationship. The square wave is present at the collector of Q110; the triangular wave, at the emitter of Q114. The circuit provides these signals with constant amplitude over the frequency range of the rate circuit.

2.3.1 Auto

In the auto position, the rate circuit is adjustable over four decade frequency bands as determined by the position of the sweep rate switch. The rate circuit will sweep from 100 seconds per sweep to 100 sweeps per second.

Capacitors C114 and C120,C115,C116, and C117 make up the capacity part of the time constant for the four sweep rates. Two ganged variable resistors consisting of R803C and R803B provide the vernier frequency range over each sweep rate decade.

2.3.2 Line

In the line position, a 60 Hz signal from the power transformer is coupled through C103 and C104 to the base of Q109. The circuit locks the rate generator to the line frequency. The other poles of the switch convert the circuit time constants, etc, to insure the locking and provide the same amplitude as in the auto mode.

2.3.3 Manual

In the manual mode of operation, the rate circuit is bypassed and a DC voltage is provided at the output of the rate circuit. R803A section of the rate circuit vernier provides adjustment of this DC voltage through the same amplitude swing normally available from the rate circuit.

2.3.4 CW

In the cw position, the entire rate circuit and start-stop circuitry is disabled leaving only the linearity circuit in operation to determine the cw output frequency. When the unit is switched from start-stop mode to the conventional Fo/ΔF mode, the variable marker pot is switched to the linearity circuit and provides an adjustable DC level which tunes the sweeper through the frequency range as indicated by the pointer associated with the variable marker - Fo control.

2.3.5 Trigger

In the trigger position, the sweep mode switch connects the necessary circuitry to inhibit the rate circuit in such a way that the blanking is in the off state and no triangular waveform is being generated. The rate circuit is inhibited by Q107 which is a hold off gate. An external trigger signal is fed to a voltage comparator, Q101 and Q102. The trigger level control sets the proper input waveform level at the collector of Q102 to cause the

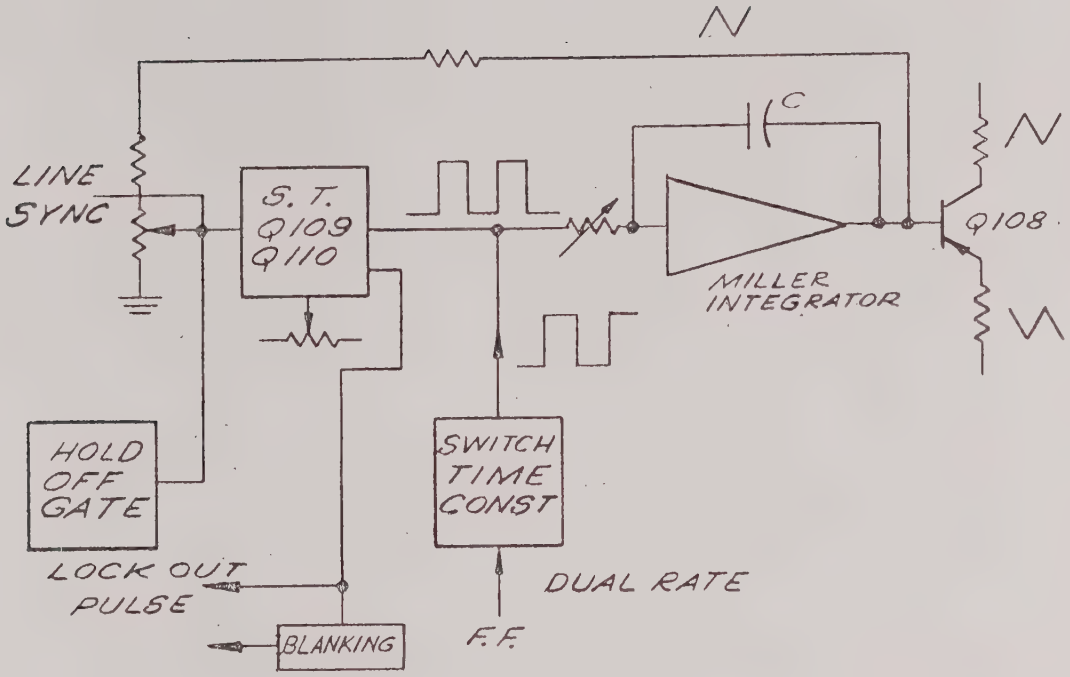
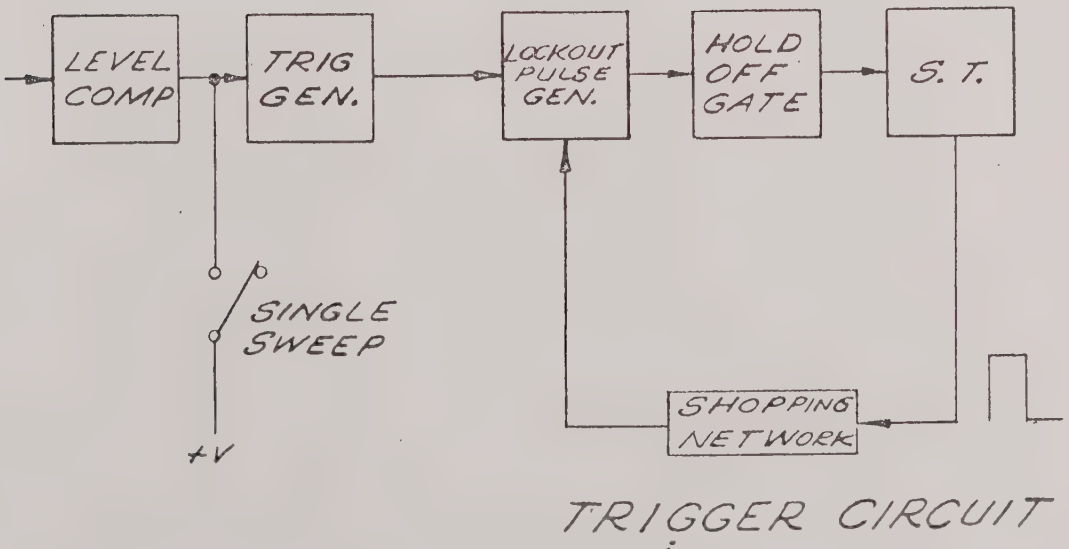


FIGURE 2-3 RATE CIRCUIT



TRIGGER CIRCUIT

FIGURE 2-4

Schmidt Trigger, Q103 and Q104 to generate a pulse. This pulse is shaped and coupled to the hold off circuitry consisting of another Schmidt Trigger, Q105 and Q106, and the hold off gate, Q107, R105 establishes a negative bias on the base of Q105 which in turn holds the rate circuit off. When a positive going pulse of sufficient amplitude to overcome the negative bias is created by an external signal, the Schmidt Trigger, Q105 and Q106 turns off the hold off gate and allows the rate circuit to start integrating upward in voltage. When the integrator output reaches a certain level, the Schmidt Trigger, Q109 and Q110 changes state and the integrator will start integrating back down, but a negative going pulse is generated which turns the hold off circuit back on, and the integrator will integrate back down and the entire unit returns to its pre-triggered condition. See figure 2-2 and 2-4.

2.3.6 Single Sweep

In single sweep, the trigger circuit functions exactly the same except when the single sweep button is pushed, a positive voltage is momentarily applied to the base of Q103 which actuates the trigger sequence.

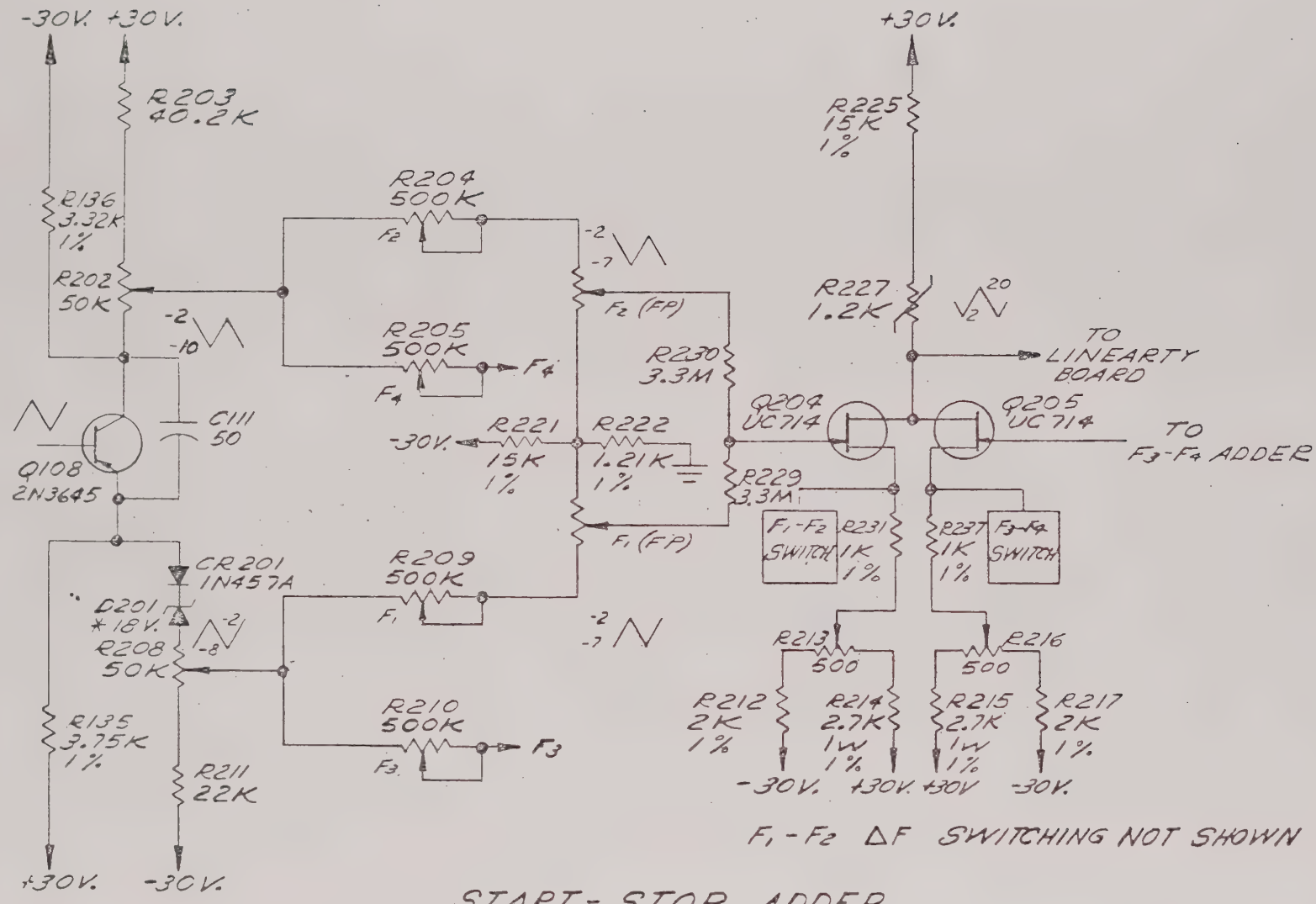
In the other modes, R108 biases the trigger circuit in such a manner to allow the rate circuit to free run or be syncronized with the line.

2.4 START-STOP ADDER

The output from Q114 of the rate circuit is coupled to a paraphase amplifier, Q108. See figure 2-5. This transistor provides two outputs; the emitter waveform being exactly the same as the input and the collector waveform is an inverted waveform of approximately the same amplitude and at a different DC level. Two internal controls, R202 and R208 are used to set the upper most peak of both the regular and inverted waveform to the same DC level as appears at the junction of R221 and R222. One side of F_1 and F_2 are tied to this junction, a voltage which is the same as the peak of the regular and inverted waveform, plus the amplitude of the waveforms are made equal by adjusting R204 and R209, and applied to the other end of F_1 and F_2 pot, then through two resistor adders, R229 and R230 at the junction (gate of Q204) appears a waveform where F_1 will vary only one peak and F_2, the other peak. This is the start-stop signal which when amplified by Q204 is coupled to the oscillator, provides independent adjustment of the end frequencies of the swept signal.

2.5 DUAL SWEEP WIDTH

At the wipers of R202 and R208 is an exact duplicate of the F_1-F_2 start-stop adder circuit except F_3 and F_4 controls are in this circuit. The other adder consisting of R236 and R237 (gate of Q205) (when the amplitudes have been properly set by R205 and R210) is a start-stop signal which also sets the end of the swept signal. When the sweep interval switch is placed in F_1-F_2/F_3-F_4, the sweep generator sweeps between F_1 and F_2 and



START-STOP ADDER

FIGURE 2-5

then during the next blanking period, sweeps between F_3 and F_4. This is accomplished by alternately connecting the two adder outputs (drains of Q204 and Q205) to the oscillator via the linearity circuit as shown in figure 2-6. The blanking signal is fed to a counter flip-flop which divides the blanking frequency by two and provides the switching signal for the dual sweep width operation. Two transistors, Q201 and Q202 provide the switching voltage to alternate the FET adder output.

2.5.1 Dual Rate

The square wave present at the collector of Q110 is coupled to Q208 and inverted in phase. It is fed to Q209, an emitter follower and Q210, another emitter follower. The waveform present on the emitter of Q209, also is different and the resulting pulse is used to trigger the divide by two flip-flop for the dual sweep width and dual sweep rate operation. When the dual rate button is pushed, the divide-by-two flip-flop output is coupled to Q203 which is connected back to the rate circuit. When Q203 conducts, it changes the charging time constant of the Miller Integrator in the rate circuit, and hence on alternate sweeps, the sweep time is lengthened by about 30%. See figure 2-2. This dual rate feature is not operative when the sweep interval switch is set to F_1-F_2/F_3-F_4 since the flip-flop is now being used for dual sweep width.

2.5.2 Video Blanking

The inverted blanking present on the collector of Q208 is also coupled to an FET, Q211 which is used for video blanking. The scope vertical terminal is grounded through Q211 when it conducts providing a zero reference retrace. This circuit may be disabled with a slide switch on the plug-in board.

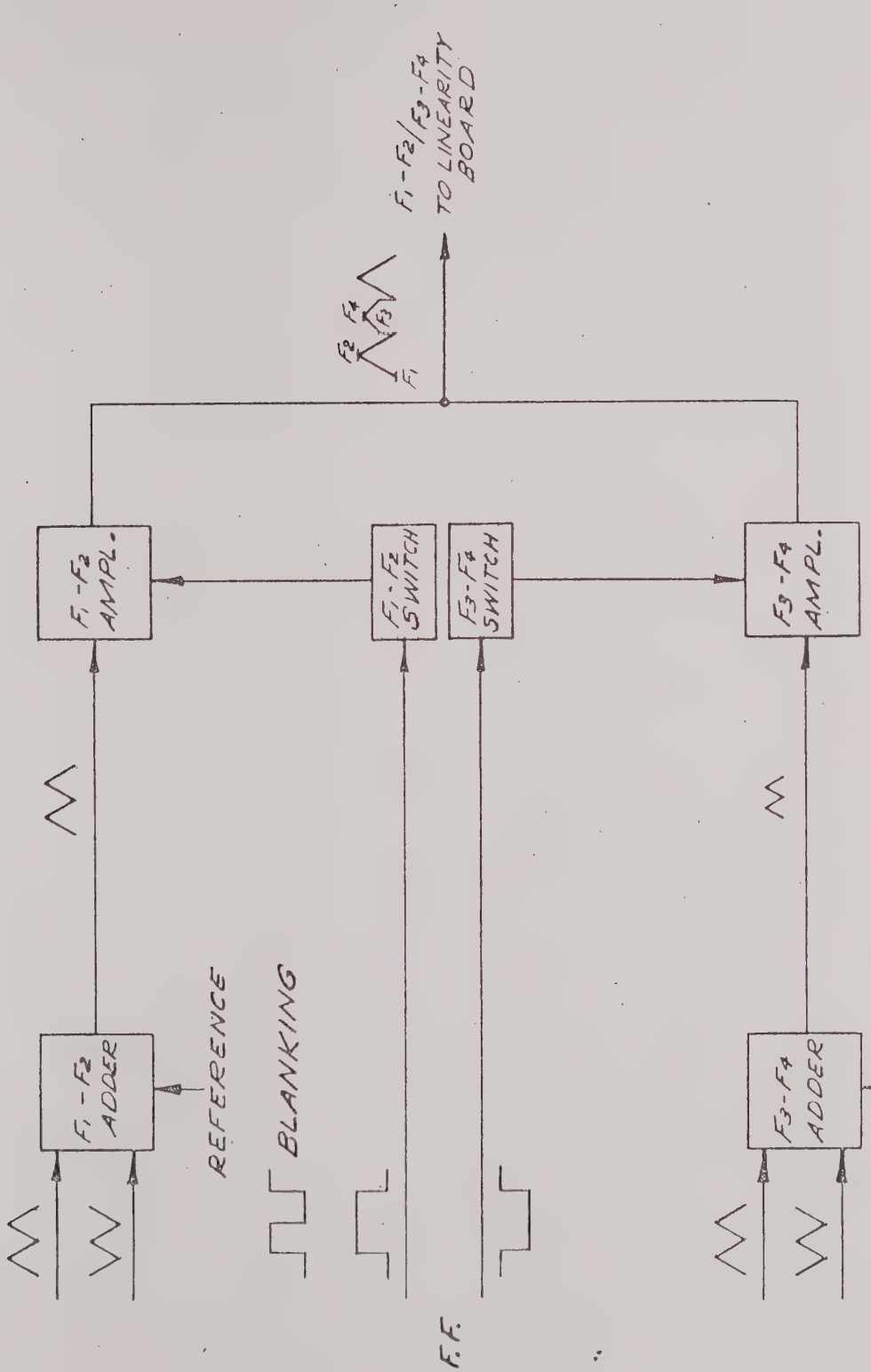
2.5.3 RF Blanking and Pen Lift

The output of Q210 is used for blanked B+ for the sweep oscillators, the pulse markers, and to blank the leveler. Also on the two slowest sweep time positions, the blanking is coupled to Q212 and Q213 to operate a relay used to pen lift on an external recorder. See figure 2-7. A slide switch determines if the rear panel pen lift connector is to be grounded during retrace or grounded during trace time.

2.5.4 Blanking and 1 KHz

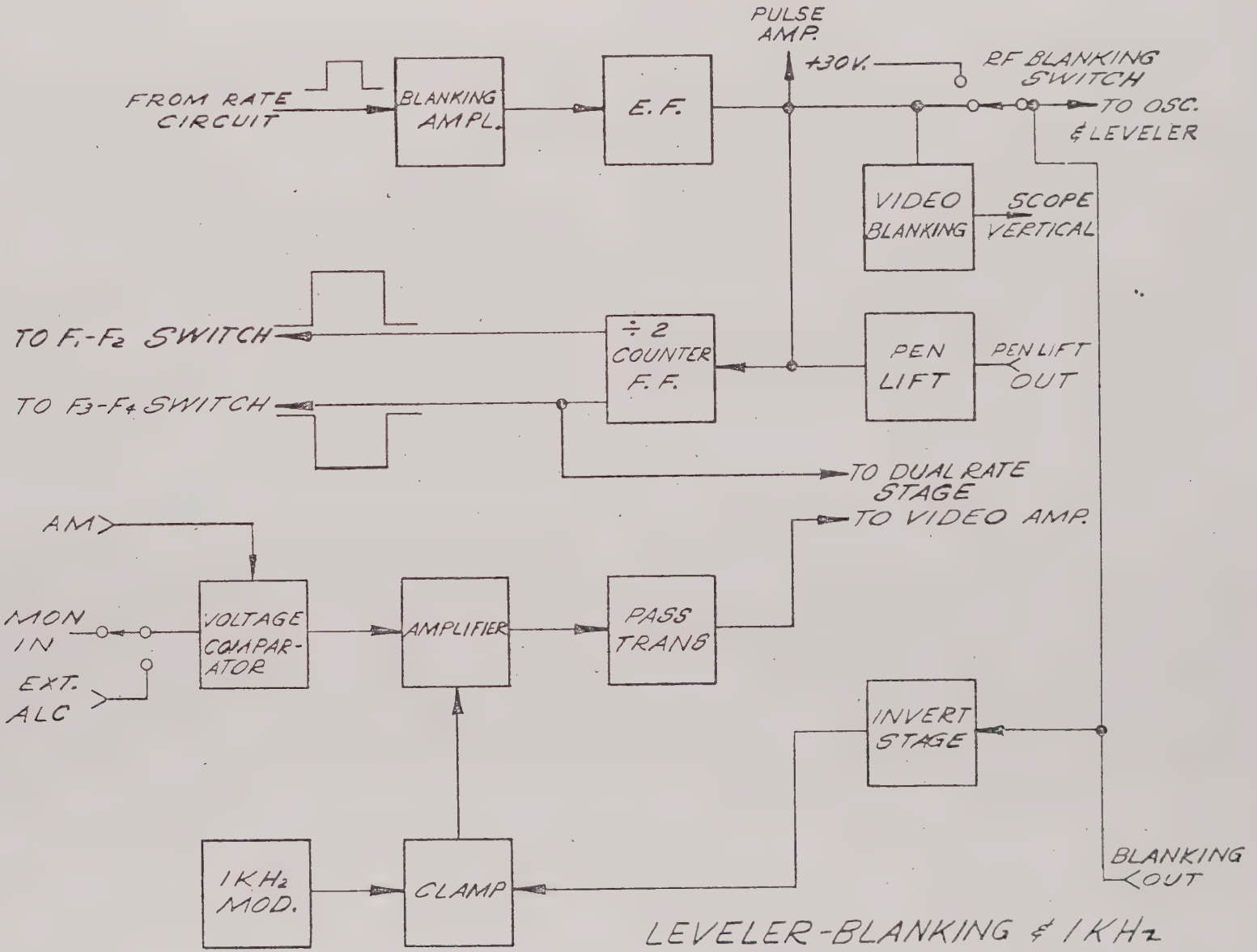
When the front panel RF blanking button is pushed, the output of Q210 is disconnected from the sweep oscillators and leveler. Also rear panel blanking out connector is disconnected. A +30V is connected in its place. The outputwill be present during trace and retrace, and if a reference retrace is desired, the video blanking must be turned on. Video blanking is not recommended at low levels due to offset caused by leakage in the FET.

In the leveler, Q457, Q456, and Q453 are used to provide blanking of the leveler during retrace. During retrace, the leveled B+ is removed from the video amplifier. A 1 KHz multivibrator is also provided which turns



START-STOP CIRCUIT

FIGURE 2-6



LEVELER-BLANKING & 1KH2

FIGURE 2-7

the leveler on or off at a 1 KHz rate to provide 1 KHz 100% modulation in all modes of operation.

2.5.5 Tuning Mode

When the unit is switched from start-stop to the conventional Fo-ΔF mode, the F_1 and F_2 controls are removed from the adder circuit and replaced by two pots, R813 and R814 which have been set to give the same amplitude signal out of the adder as would be provided if the F_1 and F_2 controls were set for maximum sweep width. F_3 and F_4 still function as normal except the F_3-F_4 maximum frequency is limited by the setting F_1. In this mode of operation, the F_1 control now becomes a calibrated ΔF or sweep width.

2.6 LINEARITY

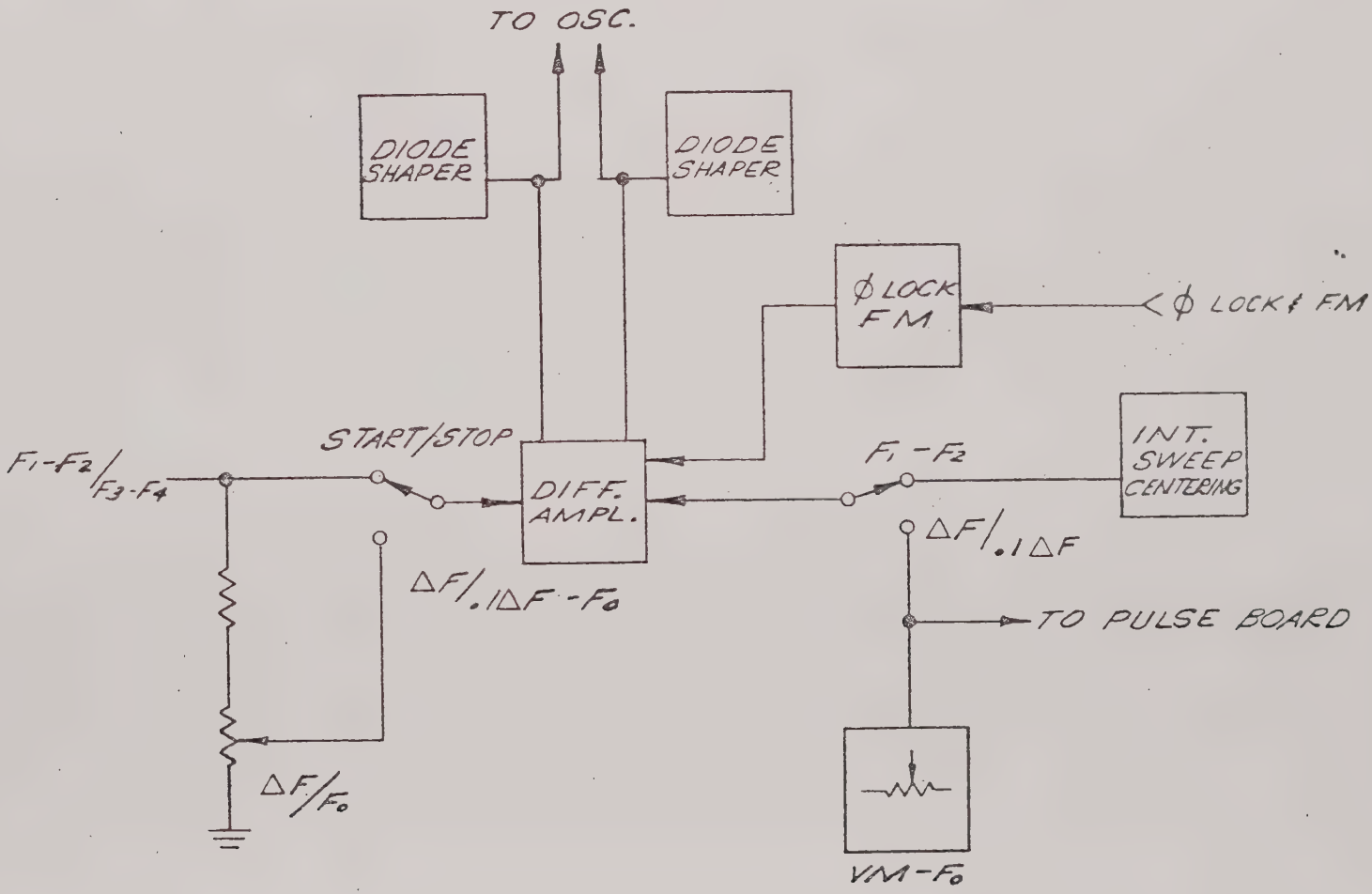
An emitter follower using Q701 is the coupling stage between the start-stop adder output circuit and the linearity circuit. The emitter follower output is coupled through R717, R719, and R724 which are used to set the amplitude and DC level of the triangular waveform for proper operation in both start-stop and conventional operation. The waveform is amplified by a differential amplifier. Q702 and Q703, and present at each collector is a waveform of sufficient amplitude and 180° phase difference to sweep the oscillators in the proper manner. See figure 2-8.

The diode break circuitry consisting of CR701, CR702, CR703, CR704, CR705, and CR706 distorts the drive signals at the collectors of the differential amplitifer. This circuit is piece wise linear. For example, for any assumed combination of forward and back biased diodes, the circuit has a linear characteristic. As the voltages at the collectors of these two transistors increase, these diodes sequencially conduct and the resultant waveform is distorted. The shape of this waveform can be adjusted with the potentiometers included in this circuit. These two, 180° out of phase, distorted, drive voltages are coupled to the varactors in the two sweep oscillators. In the start-stop mode, R725 establishes the center frequency of the sweep. In the ΔF mode, R817 is the adjustable calibrated front panel control that tunes center frequency.

For phaselock and external FM, Q704 couples a signal into the base of the differential amplifier which varies the voltage to the sweep oscillator and shifts their frequency accordingly.

2.7 SWEEP OSCILLATORS AND MIXER

The two sweep oscillators, mixer, and low-pass filter are shown in figure 6-15. The two sweep oscillators have essentially the same characteristics, each being a tuned line varactor swept oscillator. One oscillator, using transistor Q501, sweeps through the frequency range of 1350 MHz to 1600 MHz. The sweep drive voltage for this oscillator is coupled to the varac-



LINEARITY

FIGURE 2-8

tor, CV501, which changes the electronic length of the tuned line, thereby changing the oscillator's output frequency.

The second sweep oscillator, using transistor, Q502 sweeps within the range of 1350 MHz to 1100 MHz. The varactor in this circuit is CV502. The outputs of these two sweep oscillators are coupled to the mixer diode, CR501, and the lower sideband output from this mixer is filtered in the low-pass filter, Z501, and delivered to the video amplifier. As the one oscillator is sweeping down in frequency, the other is sweeping up; consequently, the resultant output sweep width is twice as great as that provided by either oscillator.

Center frequency is controlled by varying the DC level of the sweep drive to each oscillator, while sweep width is changed by varying the amplitude of the distorted drive signal. The outputs of the two sweep oscillators are very loosely coupled to CR501 so that the mixing is accomplished at extremely low signal levels within the square law region of the mixing diode. This results in a very low spurious output signal.

2.8 VIDEO AMPLIFIER AND LEVELER

The circuitry shown in figure 6-12 and 6-15, consists of a video amplifier, monitor, leveler, and an output attenuator. The video amplifier amplifies the output from the low-pass filter described above.

This video amplifier has a relatively flat frequency response from 5.0 MHz to 500 MHz. There are four stages of gain consisting of Q401 thru Q404, and their associated circuitry. Each stage is of the common emitter configuration and is essentially identical to the other three.

The output of the video amplifier at the collector of Q404 is coupled to Z401, a feed-through termination, consisting of a precision 50 ohm resistor which serves to establish the output impedance of the video amplifier. The output from Z401 is fed through the rotary attenuators to the RF out connector on the front panel.

A sample of the RF output at Z401 is rectified and filtered by the monitor circuit consisting of CR401, C434, C435, and R433. The resulting negative signal is fed to the automatic leveling circuit consisting of Q454 and Q455, which form a differential amplifier. The monitor signal is amplified and reversed in phase in Q454. The other half of this differential amplifier, Q455, has its base connected to a stable reference voltage which sets the operating point of the amplifier. The unit can be amplitude modulated by feeding in a waveform on the connector provided on the rear panel. The signal from the collector of Q454 is again amplified and reversed in phase by Q452. This signal is applied to emitter follower, Q451. The output from Q451 is used as B+ voltage for the first three stages of the video amplifier.

This closed loop amplifier thus detects any changes in RF output at the monitor point, the junction of CR401, Z401, and R434, and supplies a pro-

perly phased change in B+ voltage to the video amplifier which results in a constant amplitude to flat RF output.

Because the leveler is maintaining a constant RF output voltage at the monitor point, this point is a zero impedance constant voltage point, consequently, Z401 creates the source impedance for the sweep generator.

The reference point in this amplifier system, the base of Q455 is connected to the front panel RF vernier control. By varying this control, the operating point of the differential amplifier is changed which allows the RF output level to be changed.

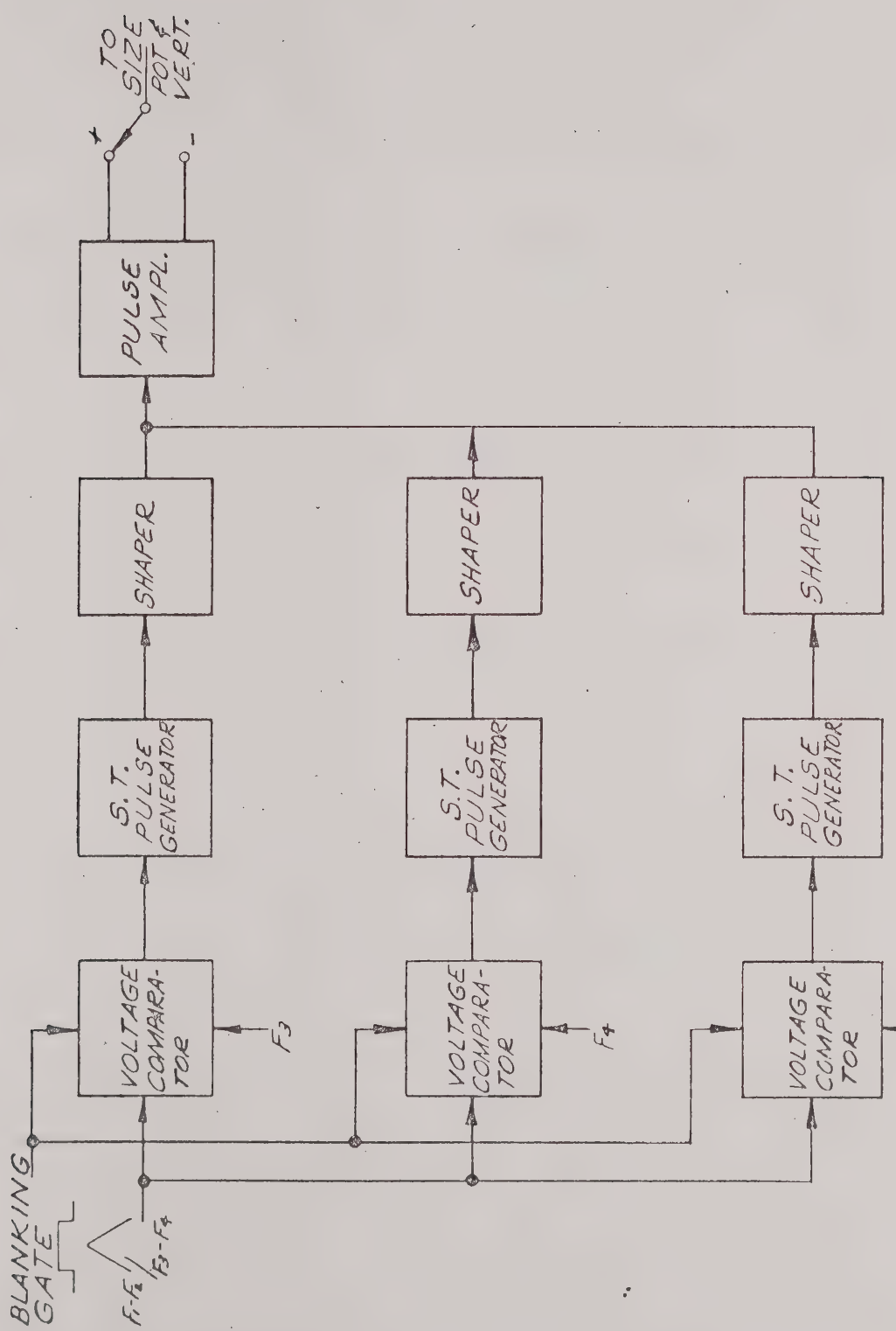
CR451 in the emitter of Q451 prevents back biasing of the oscillator transistors and damage to them in the event of a component failure in the leveler.

Included within the unit is a switch, S812 which bypasses the internal monitor and connects the leveler circuit to a back panel external ALC input connector. This allows the unit to be leveled at some remote location if the user provides a detected monitor signal from the leveling point.

A sample of the RF output for use in the marker circuitry is coupled through R434 to the marker/mixer. This sample of the swept signal is necessary for production of markers in the birdy-by-pass system.

2.9 PULSE MARKERS

The pulse markers are derived from the triangular waveform out of the start-stop adder as shown in figure 2-9. The triangular waveform is coupled into one side of a voltage comparator, Q601A. A DC level is coupled into the other side of the comparator, Q601B, from a front panel control. The DC voltage sets the level of the triangular waveform at the collector of Q601A. Connected to this collector is a Schmidt Trigger, Q603 and Q604 which changes state as the triangular wavform present at the collector goes more positive thru a certain value which is the trigger point of the Schmidt Trigger. The output of the Schmidt Trigger is differentiated to give a sharp pulse and fed through a diode adder to a pulse amplifier, Q645. The variable marker, and F_4 are also generated in identical circuits as described above with the variable markers coupled to Q645 all the time, but F_3 and F_4 are connected only when the sweep interval control is in the F_1-F_2 markers and F_1-F_2/F_3-F_4 position. The Schmidt Trigger hystersis is such that at narrow start-stop sweep width settings, the triangular waveform may not be sufficient to turn the Schmidt Trigger on and off. The blanking voltage is coupled to the voltage comparators of the three pulse circuits to switch the collector voltage over a large range to insure resetting the Schmidt Trigger. If the F_1-F_2 controls are reversed such that F_2 is the lower frequency, and the unit sweeps backward, no pulses will be present.



PULSE AMPLIFIER

FIGURE 2-9

2.10 BIRDY AMPLIFIER

The birdy amplifier system consists of a series of common emitter amplifier stages and an amplifier bandpass shaping circuit which is used to shape the birdy markers.

The birdy outputs from the plug-in markers are amplified in Q301, Q302, and Q303 shaped by a variable bandpass network. The shaper pot, R325 provides about a 2 to 1 change in bandwidth of the birdy marker and further amplified in Q305. The resultant amplified birdy is coupled to the scope vertical connector on the front panel or if horizontal markers are required, the birdy marker is connected to the horizontal amplifier.

Diode CR301, when inserted in series with the marker output will clip off the negative half for x-y recorder applications.

The external marker birdy from the marker mixer is amplified in Q304 and subsequently shaped by the same circuit as above and amplified in Q305.

As shown in figure 2-10, one amplification stage is provided for two plug-in marker sockets. One amplifier is provided for the external marker birdy, and the outputs from all four amplifiers are tied together at the input to the shaping circuit.

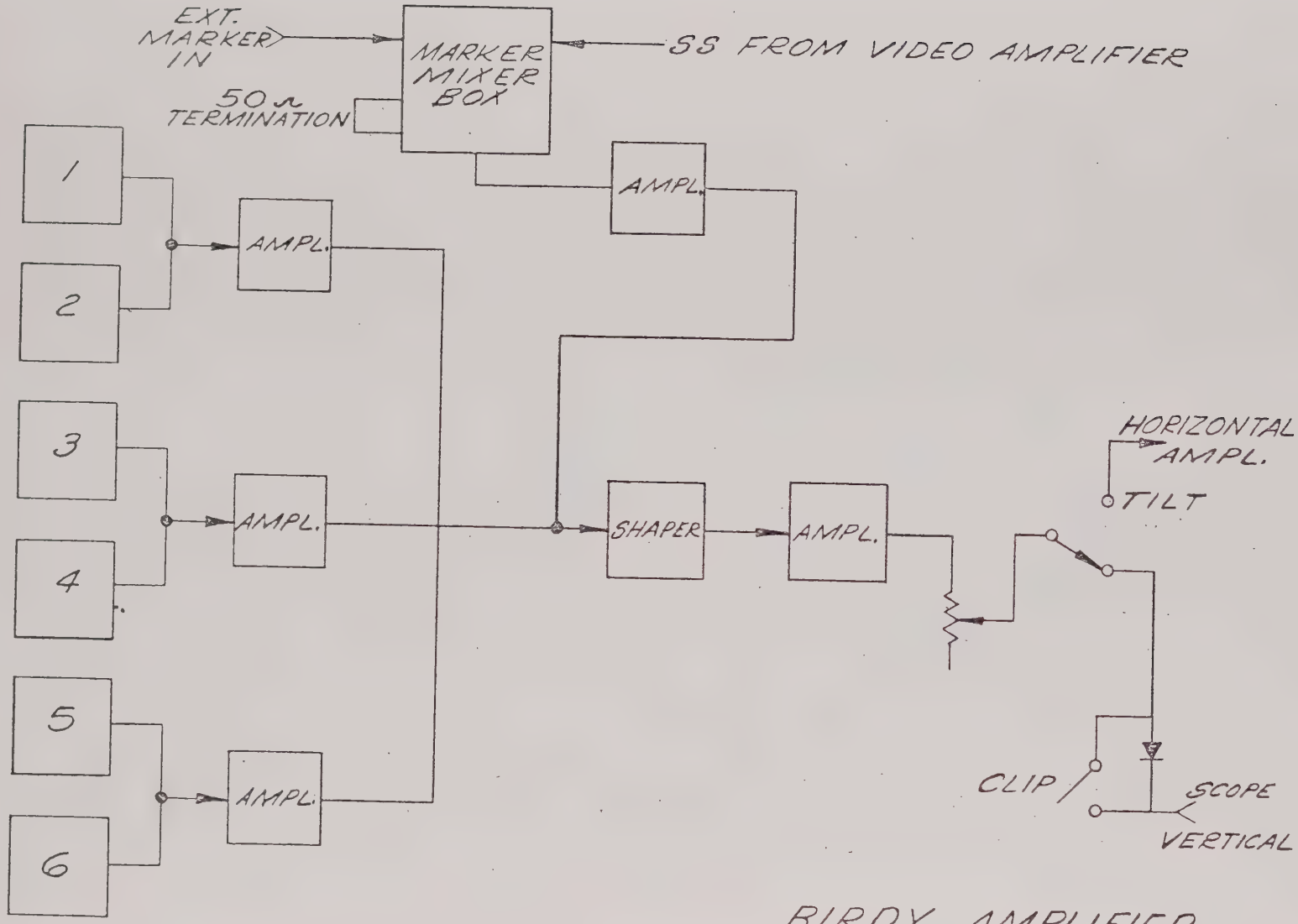
2.10.1 Plug-In Markers

Six plug-in marker receptacles are provided which are activated from switches on the front panel. These switches, S301, S302, S303, S304, S305, and S306 as shown in figure 6-9, switch the B+ to these marker sockets, thereby turning off (or on) the marker plug-ins. Solid state plug-in markers are available for either single frequency or harmonic marking. See figure 2-11 for plug-in marker installation.

2.10.2 Log Amplifier

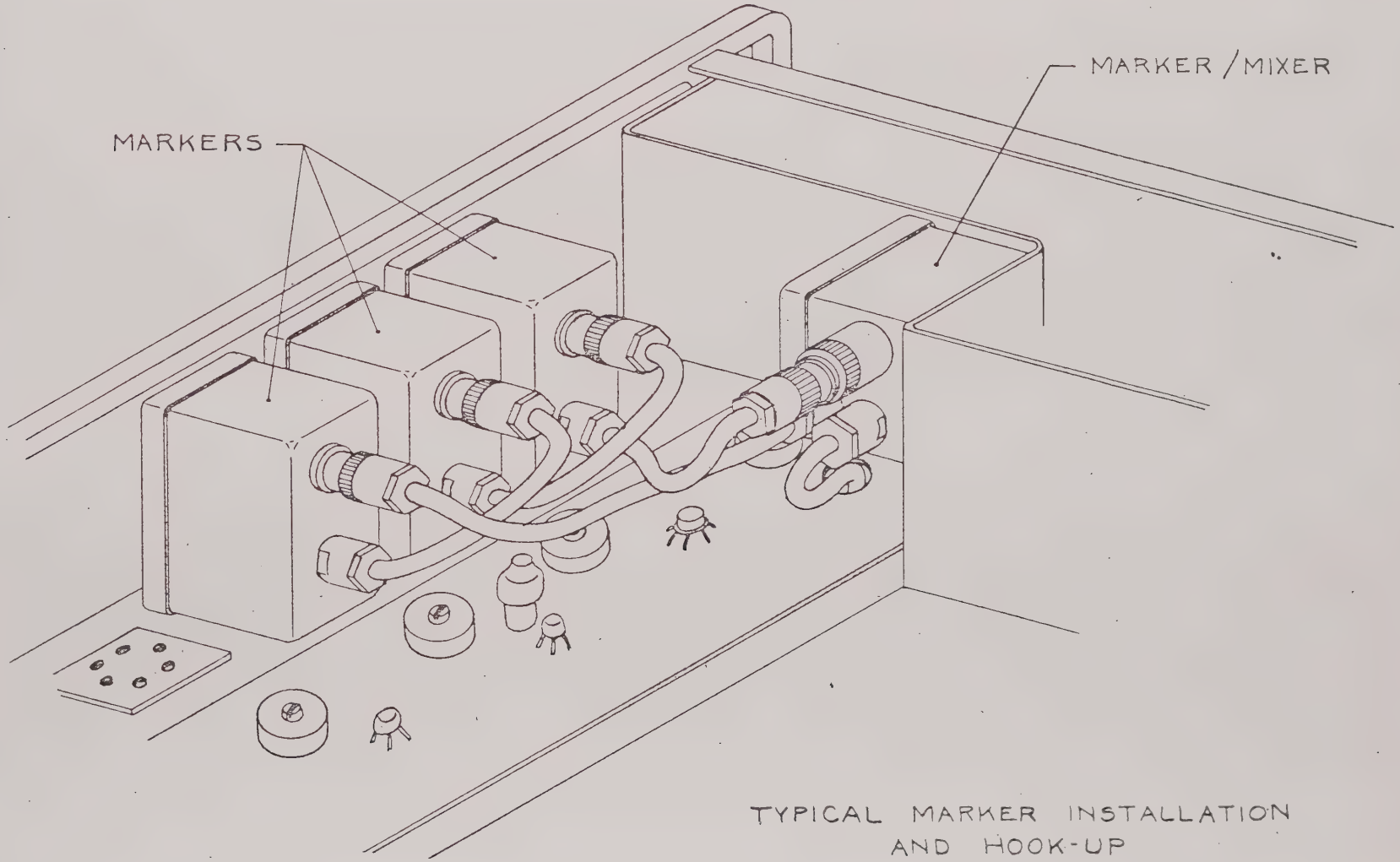
The logarithmic amplifier consists primarily of a linear integrated circuit operational amplifier IC451, and feedback transistor, Q460. The output of the operational amplifier is adjusted by the balance control, R479, such that the base-emitter junction is forward biased. The short circuit IC versus Veb transfer characteristics of the logging transistor is accurately logarithmic over a large dynamic range. In this configuration, with the built in detector connected to the input of the logarithmic amplifier, the output of IC451 is a logarithmic function of the input RF voltage. See figure 2-12.

Since this output is not sufficient in amplitude to equal the normal detector output, a fixed gain amplifier consisting of IC452 is added. The output from the stage is coupled to the scope vertical. The output amplitude is adjusted by R492 and the DC level set by R482. The integrated circuits require a lower voltage than is normally avaiable and



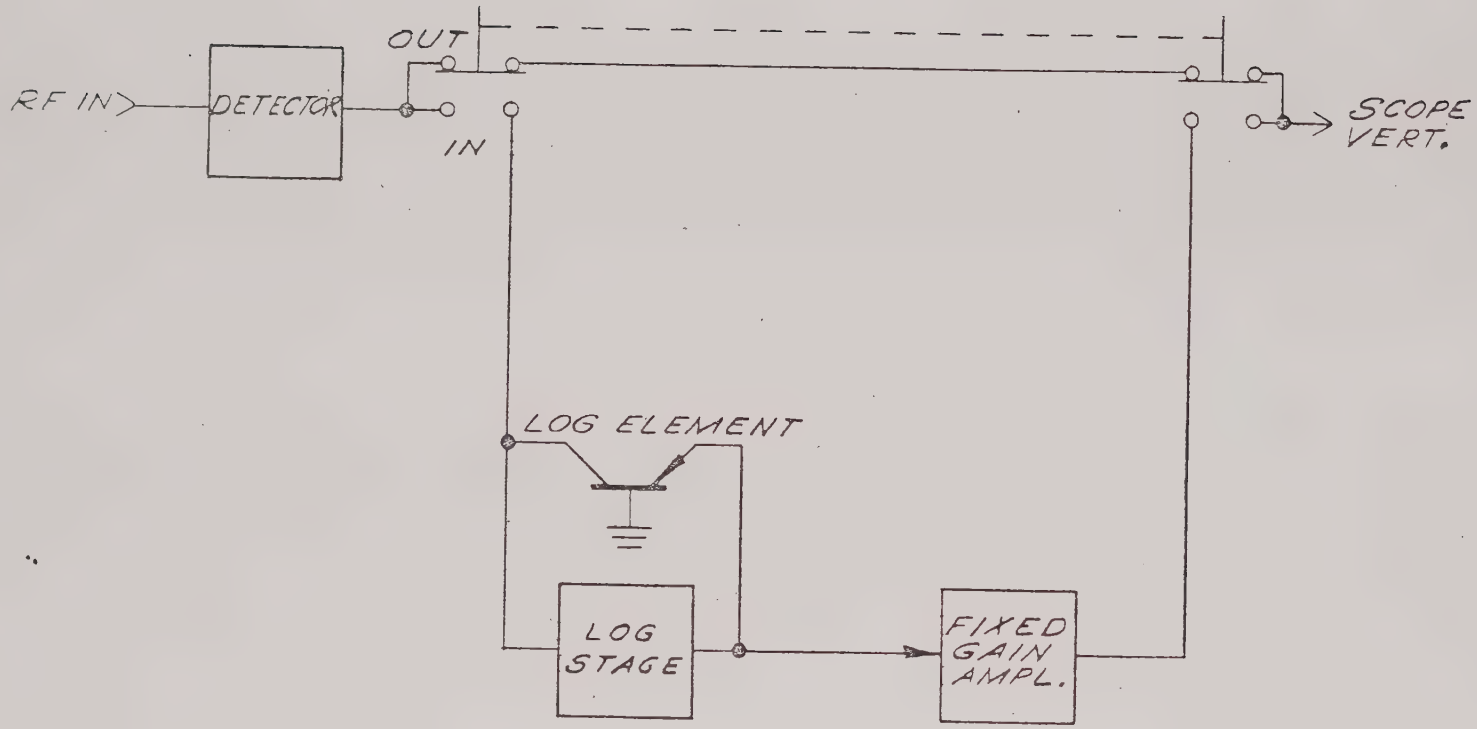
BIRDY AMPLIFIER

FIGURE 2-10



TYPICAL MARKER INSTALLATION
AND HOOK-UP

FIGURE 2-11



LOG AMPLIFIER

FIGURE 2-12

hence, two zener supplies consisting of D451 for +15V and D452 for -15V are contained on this board.

2.11 POWER SUPPLY

The DC power supply for this unit is shown in figure 6-8. This circuit provides regulated and current limited ±30V, ±110V, and a regulated ±7V. An unregulated ±50V is also supplied. The input transformer, T1 is designed so that the unit will operate from either 115V or 230V line. Switch, S2, on the power supply board selects either input voltage. The unit is usually shipped with S2 in the 115V position.

SECTION 3

OPERATING INSTRUCTIONS

3.1 FRONT PANEL CONTROLS AND CONNECTORS

3.1.1. F_1-F_2

F_1 and F_2 are used to vary the start and stop frequencies of the swept output. A slide rule dial with indicators is used to provide exceptional resolution.

3.1.2 Tuning Mode

In the F_1-F_2 start/stop position of the tuning mode control, a pulse marker is present and is used as a calibrated variable marker. In the ΔF mode, F_1-ΔF becomes a calibrated sweep width or ΔF control and the variable marker becomes a calibrated center frequency control, Fo. In the .1ΔF the calibrated sweep width scale is divided by ten or a maximum sweep width of 50 MHz.

3.1.3 RF Level Control

This control is used to provide vernier control of RF output over a 10 db range.

3.1.4 RF Attenuators

Two rotary attenuators are provided at the RF output of the generator. These two rotary attenuators can be used to vary the output level by 70 db with a resolution of 1 db.

3.1.5 Sweep Interval Control

This function switch is used to select among four different modes of swept output.

1. F_1-F_2 mode is a normal start/stop sweep mode.
2. F_1-F_2 with markers - This mode provides the same swept output as F_1-F_2 mode with the addition of two pulse markers identified as F_3 and F_4. The amplitude of these markers can be varied with a front panel control. The position of these markers can be varied by adjusting the F_3 and F_4 frequency controls.
3. F_3-F_4 mode - In this mode, the sweep generator will sweep as if F_3 and F_4 were the start and stop frequencies.
4. F_1-F_2/F_3-F_4 - The sweep generator on alternate cycles of swept output sweeps from F_1 to F_2 and then from F_3 and F_4 providing a dual trace presentation which can be used to expand certain areas for careful examination of test circuit characteristics.

3.1.6 Pulse Marker Size

The potentiometer control is used to vary pulse marker amplitude.

3.1.7 Dual Rate Control

This push-button switch, which operates in all, but F_1-F_2/F_3-F_4 mode, activates a special feature which allows the user to conveniently set sweep rate at the highest possible value while still obtaining an undistorted bandpass presentation. When this circuit is energized, on alternate cycles of the swept output, the sweep speed is varied resulting in two displaced presentations if the circuit response is too slow for the sweep rate setting.

3.1.8 Sweep Rate Control

This switch and potentiometer combination provides control of the rate at which the swept output is varied. Sweep times from 0.01 to 100 seconds are provided with the potentiometer providing a continuously variable adjustment at each range setting. In the manual sweep rate mode, this same control can be used to manually sweep the unit for careful investigation of certain portions of the test circuit's characteristic curve.

3.1.9 1 KHz Modulation

This push-button control, when energized, amplitude modulates the RF output at a 1 KHz rate. Square wave modulation is provided with modulation depth extending to complete turn off.

3.1.10 Sweep Mode Control

This control is used to switch the internal sweep generator time base among one of six different modes of operation.

3.1.10.1 Single Sweep Mode

In this switch position, the internal time base generator will sweep over one cycle when energized, thereby, providing a convenient means of obtaining an x-y display. The speed at which this one cycle will be completed is determined by the sweep rate control.

3.1.10.2 Triggered Sweep

In this mode, the time base generator can be triggered from an external source.

3.1.10.3 Automatic

Automatic is the normal sweep generator mode of operation with the sweep rate control switch and potentiometer combination controlling the rate of swept RF output.

3.1.10.4 Line Rate Mode

In this position, the sweep generator output will vary at 50/60 Hz line rate frequency.

3.1.10.5 Manual Position

In this mode, the concentric pot in the sweep rate control can be used to manually sweep the output.

3.1.10.6 CW Mode

In this mode of operation, RF blanking during retrace time is deactivated and the generator operates as a CW signal generator with Fo controlling the output frequency. Tuning mode must be in ΔF or $.1\Delta F$.

3.1.11 Single Sweep Trigger

With the sweep mode switch in its single sweep position, this push button starts one cycle of the internal time base generator resulting in one cycle of swept RF output over the frequency range selected with the sweep interval and frequency controls.

3.1.12 Trigger Level and Power On-Off Switch AC-DC, + or -

This control is used to turn on the AC power to the unit and also select the trigger level when the sweep mode switch is set for triggered sweep. The slide switches allow selection of + or - trigger slopes on either AC or DC triggering when in the triggered sweep mode.

3.1.13 RF Output Connector

The swept or CW output from the generator is available at this terminal.

3.1.14 External ALC Control

This switch can be used to convert from internal leveling to external monitor operation. When testing circuits distant from the generator, an external monitor can be used to level the instrument at the input to the device under test. The switch provides selection of this external mode of operation or the normal internal leveling circuitry provided with the instrument. If no external monitor is employed, this switch can be used to deactivate the internal automatic leveling circuitry.

3.1.15 RF Level Blanking Off

When activated, the swept RF output is no longer blanked during retrace. If a zero level retrace line is desired in this mode, video blanking is provided and can be turned on or off with an internal slide switch. This provides the necessary reference base line and also eliminates possible transients which could result from switching the RF output.

3.1.16 Logarithmic Amplifier Selection Switch

The output from the test device can be detected and logarithmically amplified within the sweep generator. This switch is used to select detection, or detection and logarithmic amplification. It also connects the amplifier or detector output to the vertical oscilloscope connector.

3.1.17 Detector Input Connector

The RF output from the circuit under test is inserted at this connector if the internal detector is to be used.

3.1.18 Video Input Connector

If an external detector is employed and it is desired to add markers to the detected output, then the detected signal is inserted at this connector. The external detector switch must be activated. See figure 3-3.

3.1.19 Vertical Output Connector

This connector provides the vertical input to the x-y display oscilloscope used in most test systems.

3.1.20 Horizontal Output Connector

A triangular waveform of approximately 10 volts peak to peak is provided at this connector for oscilloscope horizontal drive.

3.1.21 Trigger Input Connector

If the sweep generator is being triggered from an external voltage source, that source should be connected to this terminal.

3.1.22 F_3-F_4 Frequency Controls

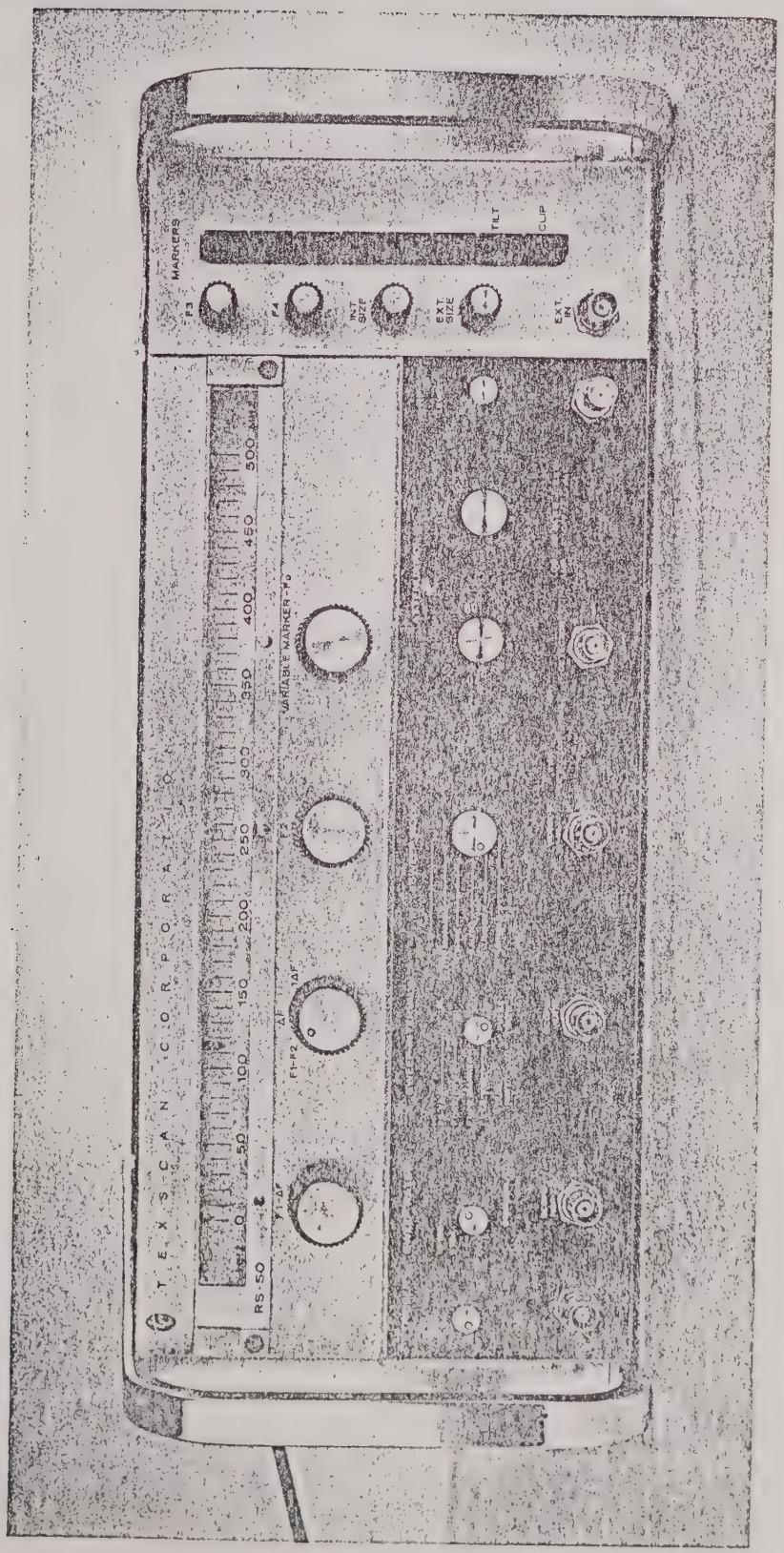
These two controls are used to vary the position of the F_3 and F_4 pulse markers on the detected output display while operating in either the F_1-F_2 with markers or F_1-F_2/F_3-F_4 modes of operation.

3.1.23 Marker Size Control

One control is provided to vary the amplitude of internal birdy markers. Up to six internal harmonic or single frequency markers can be supplied and this control adjusts the amplitude of the output of all of these six markers if energized. The external marker control varies the amplitude of the birdy marker which results if an external generator is connected to the external marker input terminal.

3.1.24 External Marker Connector

If an external signal generator is used as a marker generator to identify frequency, it is inserted at this connector.


MARKERS
F3
F4
INT SIZE
EXT SIZE
TILT
CLIP
EXT IN
TEXSCAN CORPORATION
VARIABLE MARKER-F2
F2
ΔF
10F
F1-F2
F1-ΔF
RS-50
0
50
100
150
200
250
300
350
400
450
500

FRONT PANEL

3.1.25 Marker Switch Control

Six switches are provided, each one of which energizes an internal plug-in marker socket. Up to six markers can be selected.

3.1.26 Marker Tilt Switch

This switch can be used to convert the birdy marker presentation from vertical to horizontal markers for more convenient frequency identification of sharp skirts.

3.1.27 Clip - Rectified Birdy Marker Switch

When an x-y recorder is used to display the test circuit characteristics and marker identification is desired on this recorded output, the normal birdy presentation is averaged by the recorder, thereby, losing the markers. This switch, if energized, rectifies the birdy markers resulting in clear identification of frequency when using this x-y recorder method of presentation.

3.2 REAR PANEL CONTROLS AND CONNECTORS

3.2.1 RF Level Minimum, R902

Establishes the minimum output level controlled with the RF level vernier on the front panel. See figure 3-2.

3.2.2 RF Level Maximum, R901

Establishes the maximum output level controlled with the RF level vernier on the front panel.

3.2.3 Pen Lift

Available on this connector is a set of contacts which ground the center pin during trace or retrace depending on setting of S202.

3.2.4 FM/Phase Lock

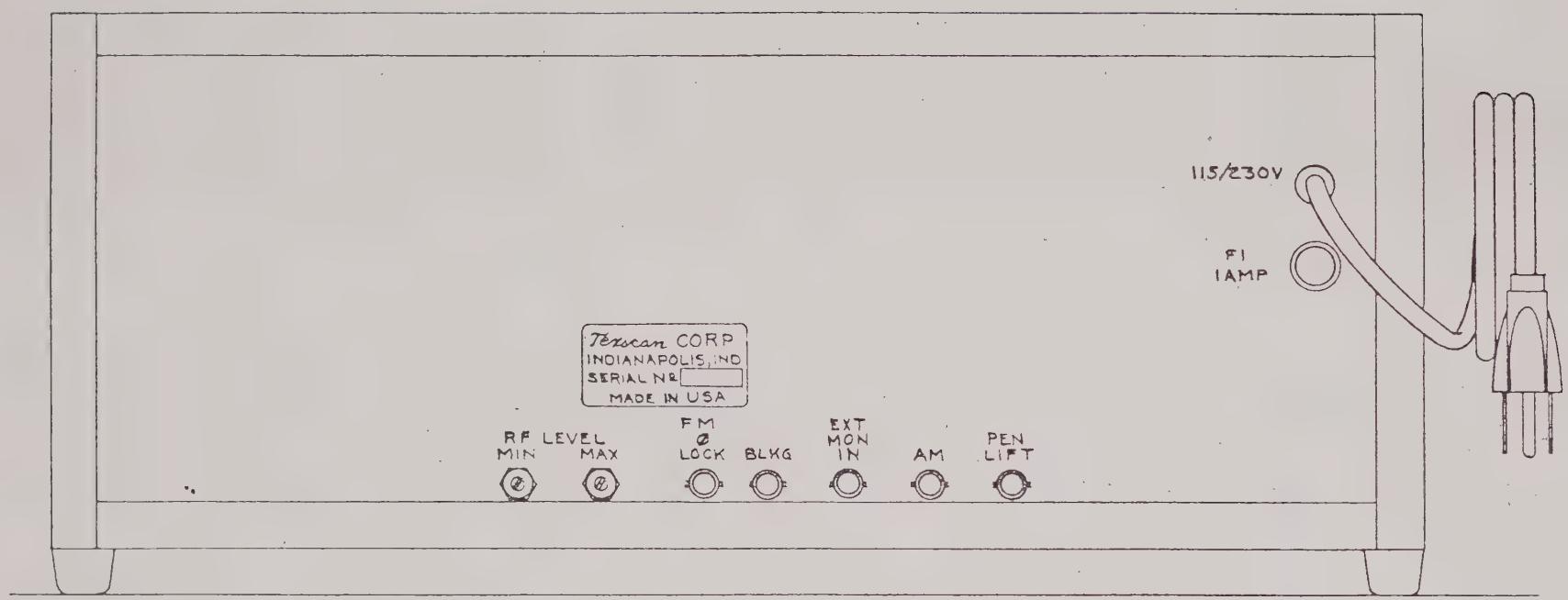
The sweep oscillator may be shifted in frequency for either modulation or locking purposes with a voltage on this terminal.

3.2.5 Blanking

The blanking voltage selected by the front panel RF blanking switch is present at this connector.

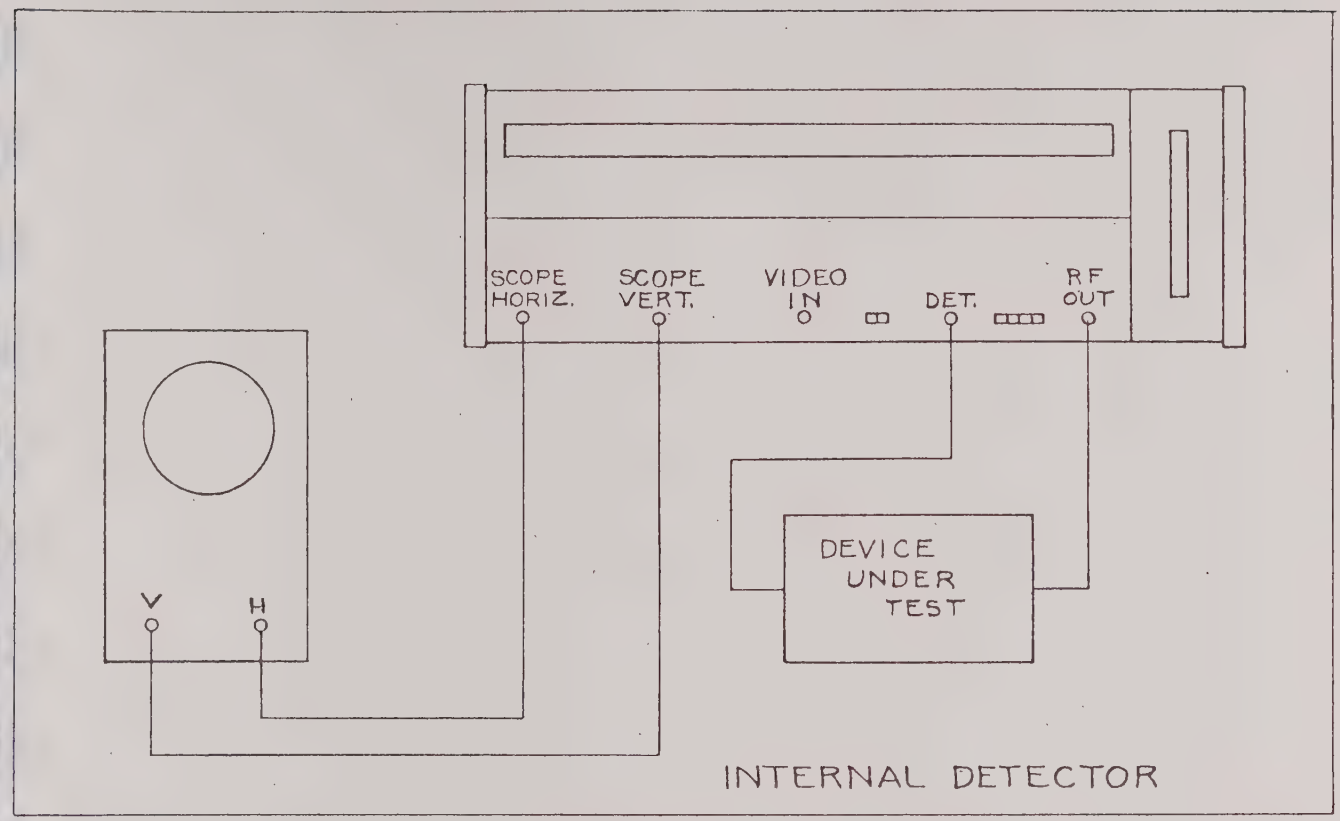
3.2.6 External ALC

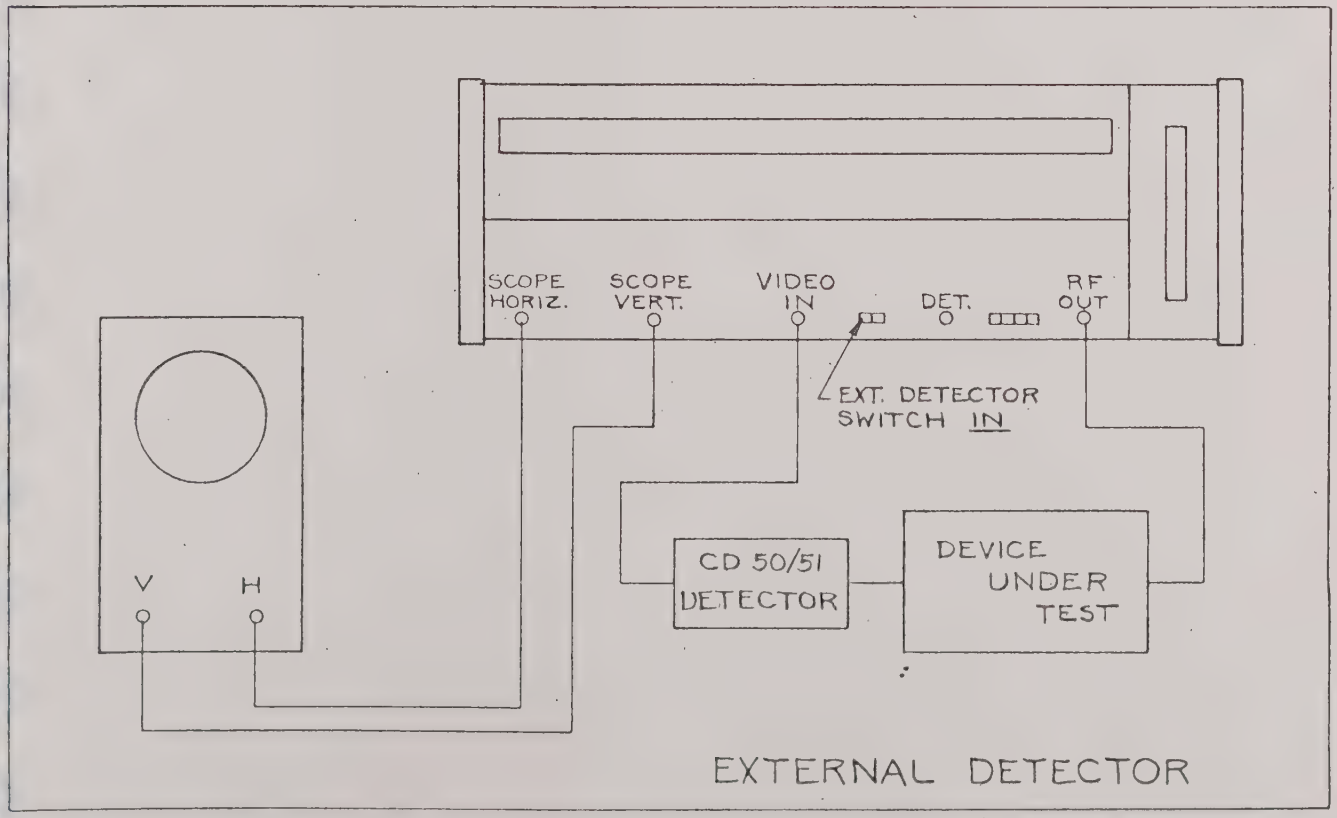
The DC output from an external monitor may be fed into this connector and provide a leveled output at the external monitor if the front panel external ALC switch is activated.



REAR PANEL CONNECTORS AND CONTROLS

FIGURE 3-2





TYPICAL TEST SETUP
FIGURE 3-3

3.2.7 AM

The amplitude of the RF output may be modulated by coupling in a signal on this connector.

SECTION 4

ADJUSTMENT PROCEDURE

4.1 INTRODUCTION

The adjustments and test of this instrument can be accomplished with the following auxiliary test equipment--an oscilloscope (such as HP-130), a VTVM, and a multimeter. It is suggested that the reader familiarize himself with the unit's circuit operation by reading Section 2 before attempting alignment of the instrument. Test of the unit for spurious level and harmonic distortion requires a high frequency oscilloscope and a sampling scope or spectrum analyzer (such as HP-8551B).

Section 4.2 gives a discussion of the internal controls which require identification during alignment of the unit. Subsequent sections describe in detail the alignment procedure for each circuit. All internal controls are properly adjusted at the factory and only minor adjustments should be required in the field due to aging or changing of components.

4.2 EXPLANATION OF INTERNAL CONTROLS

Refer to figure 4-1 to identify the location of each of the following controls:

4.2.1 R8, +30V Adjust

Adjusts the output voltage of the +30 volt power supply.

4.2.2 R14, -30V Adjust

Adjusts the output voltage of the -30 volt power supply.

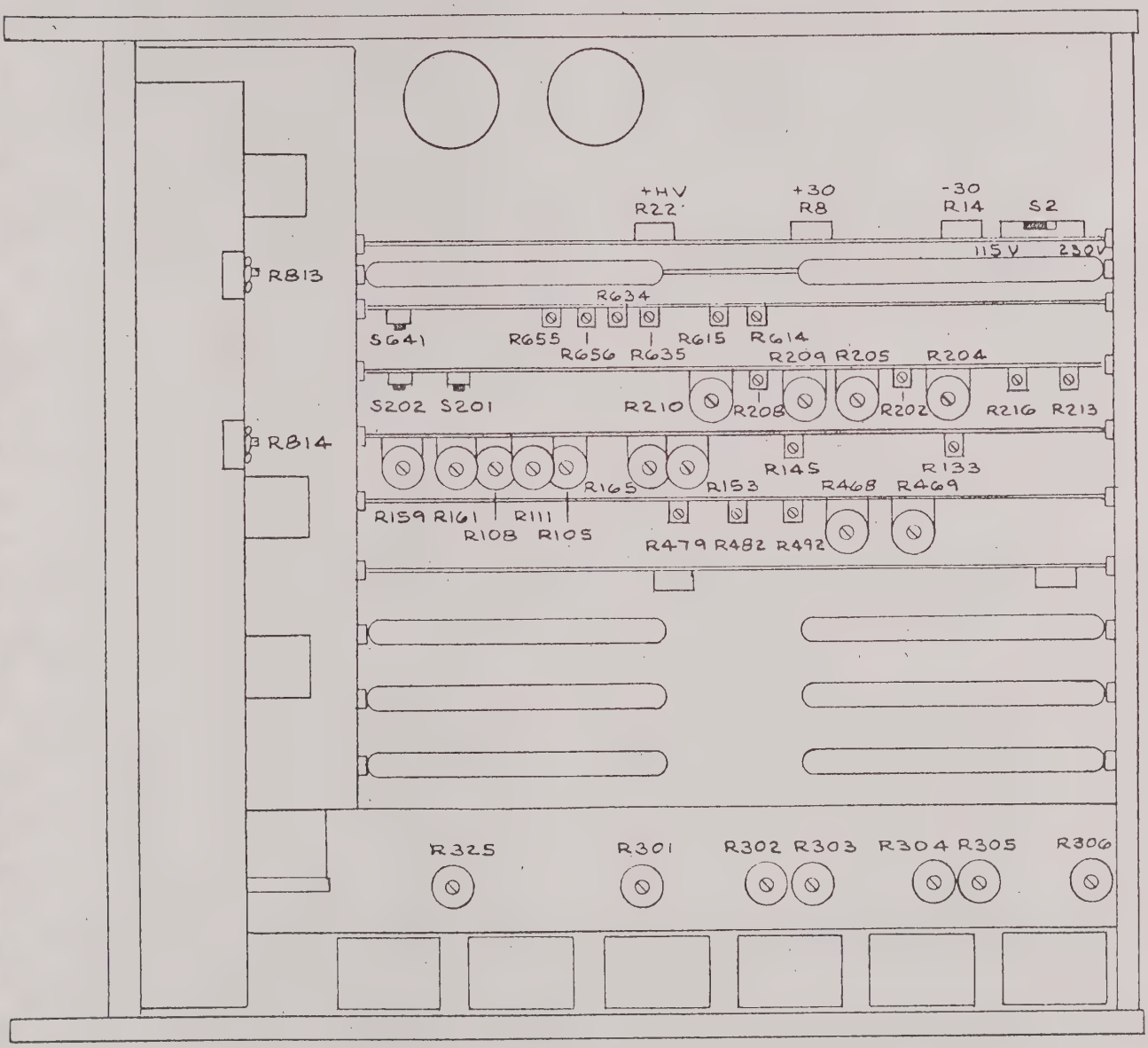
4.2.3 R22, High Voltage Adjust

Adjusts the output voltage of the high voltage supply.

RS-50	+110V
RS-70	+200V
RS-120	+200V

4.2.4 S2, 115/230 Switch

Sets the power line requirements for either 115V or 230V AC.



INTERNAL ADJUSTMENTS

FIGURE 4-1

4.2.5 S641, Pulse Marker Polarity

Determines whether the three pulse markers are positive or negative at the marker adder output.

4.2.6 R655, Variable Marker LO

Adjusts the voltage on the end of the variable marker control to set the range of the pulse marker at the low frequency end of the generator.

4.2.7 R656, Variable Marker HI

Adjusts the voltage on the other end of the variable marker control to set the range of the pulse marker at the high frequency end of the generator.

4.2.8 R634, F_4-LO

Adjusts the voltage on the F_4 control to set the range of the F_4 pulse marker to coincide with the F_3-F_4 sweep at the low frequency end of the generator.

4.2.9 R635, F_4-HI

Adjusts the voltage on the F_4 control to set the range of the F_4 pulse marker to coincide with the F_3-F_4 sweep at the high frequency end of the generator.

4.2.10 R615, F_3-HI

Adjusts the voltage on the F_3 control to set the range of the F_3 pulse marker to coincide with the F_3-F_4 sweep at the high frequency end of the generator.

4.2.11 R614, F_3-LO

Adjusts the voltage on the F_3 control to set the range of the F_3 pulse marker to coincide with the F_3-F_4 sweep at the low frequency end of the generator.

4.2.12 S202, Pen Lift

Sets the pen lift connector on the rear panel to ground during trace or retrace.

4.2.13 S201, Video Blanking

Turns video blanking on or off.

4.2.14 R205, F_4 Sweep Width

Adjusts amplitude of triangular waveform so that when F_3 and F_4 are both

set to the lowest frequency end of the generator, the two waveforms have cancelled out and no sweeping voltage exists on 4 BH.

4.2.15 R208, F_1-F_3 DC Set

Adjusts the level of the upper peak of the triangular waveform at the wiper of R208 to be 0.25 volts more positive than the DC voltage on 4 AS.

4.2.16 R202, F_2-F_4 DC Set

Adjusts the level of the upper peak of the triangular waveform at the wiper of R202 to be 0.25 volts more positive than the DC voltage on 4 AS.

4.2.17 R209, F_1 Sweep Width

Adjusts the amplitude of triangular waveform for the F_1-F_2 sweep.

4.2.18 R204, F_2 Sweep Width

Adjusts the amplitude of triangular waveform so that when F_1 and F_2 are both set to the lowest frequency end of the generator, the two waveforms have cancelled out and no sweeping voltage exists on 4 BH.

4.2.19 R216, F_3-F_4 DC Level

Adjusts the DC level of the triangular waveform on 4 BH for the F_3-F_4 sweep by changing operating point of Q205.

4.2.20 R213, F_1-F_2 DC Level

Adjusts the DC level of the triangular waveform on 4 BH for the F_1-F_2 sweep by changing operating point of Q204.

4.2.21 R159, Manual Limit - Lower

Adjusts the range of the manual control to limit the sweep drive output at the low frequency end of the generator.

4.2.22 R161, Manual Limit - Upper

Adjusts the range of the manual control to limit the sweep drive output at the upper frequency end of the generator.

4.2.23 R108, Auto - Line

Adjusts the voltage to the trigger circuit to allow the rate circuit to free run in auto mode or be line syncronized.

4.2.24 R105, Single Sweep - Trigger

Adjusts the voltage to the trigger circuit to hold off the rate circuit

until a trigger signal is applied or single sweep button is activated.

4.2.25 R111, Line - DC

Adjusts the DC level of the rate generator output voltage in the line sweep mode of operation so that it is equal to the DC level in the auto mode.

4.2.26 R165, Line Trigger Amplitude

Adjusts the rate circuit output amplitude in line sweep mode to equal the amplitude in the auto sweep mode position.

4.2.27 R165, Horizontal DC Centering

Adjusts the voltage on the horizontal to provide a symmetrical about zero horizontal scope drive waveform.

4.2.28 R145, Lower Trigger Point

Adjusts the lower trigger point for the Schmidt Trigger in the rate generator.

4.2.29 R133, Upper Trigger Point

Adjusts the upper trigger point for the Schmidt Trigger in the rate generator.

4.2.30 R479, Balance

Adjusts the operating point of the log stage to set the proper dynamic range of the logarithmic amplifier.

4.2.31 R482, Offsets

Sets the output of the log amplifier to zero with no input signal applied.

4.2.32 R492, Size

Adjusts the output amplitude of the log amplifier to equal the size of the detector by its self.

4.2.33 R468, Balance

Sets the output from the 1 KHz modulator to be symmetrical.

4.2.34 R469, Frequency

Adjusts the frequency of the 1 KHz modulator to 1 KHz.

4.2.35 R717, Drive Level

Adjusts the level of the drive waveform to be symmetrical about zero.

4.2.36 R719, F Sweep Width

Sets the maximum sweep width range of the F_1-ΔF control.

4.2.37 R724, Start/Stop Sweep Width

Sets the maximum sweep width range of the start/stop mode of tuning.

4.2.38 R725, Start/Stop Centering

This control centers the mid frequency at maximum sweep width of the unit in the center of the screen.

4.2.39 R723, Drive Size

Adjusts the linearity near the center of the range of the sweep.

4.2.40 R701 - R706, and R711 - R716 Linearity

Adjusts the linearity of the sweep.

4.2.41 R325, Shaper

Adjusts a filter network which determines the shape of the birdy marker.

4.2.42 R301 - R306 Size

Individual size control for each plug-in marker.

4.2.43 R813, F_1 Substitute and R814, F_2 Substitute

When in the ΔF tuning mode, the F_1 pot, R811, is replaced with R813 set to an amplitude to provide the same sweep drive at maximum sweep width and F_2 pot, R812, is replaced with R814 which when used in conjunction with R813, the proper waveform can be obtained for sweep drive.

4.3 ADJUSTMENT PROCEDURE

The RS Series should be adjusted board by board. After one board is operating properly, and difficulty is encountered with the next board, a checked out board should be inserted in the trouble spot. If this board operates properly, then the trouble is in the harness and should be located before continuing with the new board. Be sure the board contact pins are clean and bright. This procedure must be followed in the order given unless it is known that the boards in the sequence leading to the trouble are all functioning properly.

4.4 INITIAL CHECK

With a bare chassis except for birdy amplifier and RF boxes, insert a power supply board. With an ohm meter, check across the power plug. In

the 115V position, about 15 ohm, and 230V - about 60 ohms should be read on the ohm meter.

Connect the power cord to a Variac, and slowly bring the voltage up while alternately monitoring the +30, -30, and 110V supplies. All the supplies should begin to clamp at some voltage around 95-100V AC input. Proceed to 115V AC and then adjust the supplies for their respective voltages. Then check the supplies for ripple which shouldn't be more than 10 mv. Typically 3 mv.

CAUTION: Do not unplug or insert boards with power turned on.

4.5 RATE CIRCUIT

Insert the rate circuit board, B208-051 in Row 5, and set the front panel controls as follows:

Sweep rate 10-100
Sweep rate vernier fully clockwise
Sweep mode auto

With a scope probe connected to 5 BD or the base of Q108, adjust R133 (upper trigger point) and R145 (lower trigger point) for a triangular waveform of 2V to 20V. If the rate circuit does not free run (no triangular waveform), adjust R108 (auto-line) until it appears, then advance R108 1/4 turn more. Check all 4 positions of rate for proper operation. Check for triangular waveforms at 5 BD and 5 BE. Check 5 BA for -12V DC, and with scope at 5 BB, adjust R153 (horizontal DC centering) for a symmetrical waveform about zero volts. After 5 or 10 minute warm-up, set sweep mode to line and adjust R111 and R165 for a triangular waveform of exactly the same amplitude and DC level as occurred in the auto position.

Set the sweep mode switch to single sweep while observing 5 BD. The triangular waveform should not be present. If it is, adjust R105 until it quits and press single sweep button. One sweep should occur and then reset to its original level.

Next switch to trigger and feed the output of a suitable squarewave generator into the trigger input plug. The trigger circuit should operate or require minor adjustment of R105.

Switch to manual and see if the DC level on 5 BD changes. When the manual pot is turned, R159 and R161 will be set to travel the same range as the single sweep when it is activated.

4.6 START/STOP ADDER

Turn unit off and insert B208-050, dual rate adder board in Row 4.

Set controls same as with rate board.

Plug: Set F_1 against the left stop.
Set F_2 against the right stop.
Set tuning mode in F_1-F_2 position.
Set sweep interval to F_1-F_2 position.
Set F_3 fully counter-clockwise.
Set F_4 fully clockwise.

Connect a scope to 4 AS or junction of R221 and R222. This should be approximately minus 2 volts. Next sit the upper point of the triangular waveform on the wipers of R208 and R202 exactly 0.25 volts more positive than 4 AS. Now connect scope to 4 BH (junction of the drains of Q204 and Q205, and adjust R209 (F_1 sweep width) and R213) to obtain a triangular waveform of 2.5 to 22V.

Now turn F_2 until the pointer is exactly over the pointer for F_1 while still monitoring 4 BH. Set the scope on AC and increase gain of scope. Now adjust R204 until the triangular waveform has been nulled out; straight line. Check for proper start/stop waveform.

Check the collector of Q206 and Q207 for a squarewave of half the frequency of the blanking. Blanking of about 0-25V should be on 4 AT and 4 AP. Set the interval to F_1-F_2/F_3-F_4 and check the source terminal of both Q204 and Q205 for the half frequency squarewave of 25 volts. The two squarewaves should be out of phase one positive when other negative. Set sweep interval to F_3-F_4 and monitor 4 BH. Adjust R126 and R210 (F_3 sweep width) for a 2.5V to 22V triangular waveform. It is important that the triangular waveform for F_3-F_4 be exactly equal to F_1-F_2 in amplitude and DC level. This can be easily determined later with the markers in the unit. Turn F_4 fully counter-clockwise and adjust R205 for a null or straight line as with F_2 in earlier step. A slight readjustment may be required as part of the final set up. Switch the tuning mode to F mode and set the level of the triangular waveform at 4 BH to the same level and phase with the two small pots on the dial drive, R813 and R814.

While monitoring 4 BH, push the dual rate button. A triangular waveform with alternate longer periods should be observed. If not, check Q203 assuming the flip-flop is switching properly. Dual rate works in all, but the F_1-F_2/F_3-F_4 setting of the sweep interval control and line rate.

Set the rate switch to the two slowest settings: .01 to .1 and .1-1, check with a Simpson on the back panel pen lift connector for the reed relay to open and close. S202 determines whether the center pin of the BNC is grounded during trace or blanking time.

Video blanking, Q211, should be checked later after a signal is fed into the detector. Set S201 to the off position, slide toward top of board; no video blanking. It is virtually impossible to set up the log amplifier with the video blanking on.

4.7 LEVELER - LOG AMP BOARD

Set sweep interval to F_1-F_2.
Set sweep mode to auto - about normal viewing rate.
Connect RF output to interval detector.
Install B208-047 - leveler log amp board in Row 6.

Turn on unit. A box pattern should be seen on scope. Check RF level on front panel for proper range (10 db) and set level minimum and level maximum pots on back panel to obtain this range. Set output at 1V rms. Push RF blanking and the retrace line should vanish if video blanking is turned off. Check external monitor or ALC by pushing external ALC button. The output should increase.

With the full output of the generator coupled into the internal detector and the unit connected to an oscilloscope in a conventional manner, a box pattern should be observed with appropriate amplitude depending on the output specification of the generator. Push the log amp button in and adjust R482, the offset control, until the box pattern present doesn't appear to saturate or clamp. Adjust the balance control, R479, until the base line drops down about two/thirds in amplitude. Switch in 40 db and a small box pattern should be observed. Disconnect the RF input to the detector and adjust R482, offset for zero volts DC out. Reconnect the full output RF to the detector and adjust R492, size control, until the pattern remains the same size regardless of the log amp push button switching position.

While monitoring the collectors of Q458 or Q459, push the 1 KHz button and adjust R468 and R469 for best stable 1 KHz squarewave. Check the RF output to see that the output is being modulated at this rate. Check rear panel for blanking out and feed in an AM input for modulation from an audio generator.

4.8 LINEARITY BOARD

Plug in linearity board in Row 7; B208-052. Set F_1-F_2 against their respective stops.

Sweep interval F_1-F_2
Sweep mode - auto and reasonable viewing rate.
Install marker - HM-50.

Turn on unit and set the wiper of R717 to give a triangular waveform symmetrical around zero volt. The input should be 2.5 to 22V. Set the tuning mode to F_1-F_2 and by adjusting R724 and R723 (drive size) the output should be swept and birdy markers present. If not, check for varactor drive voltage on the proper feed-thru in the oscillator. If it is present, check the birdy amplifier board and sweep sample. After proper markers have been established, adjust R724 to have a 1.8V peak waveform and R719 to have a 2.2V peak waveform on their respective wipers. Adjust R725 to center 250 MHz on screen. Now adjust the drive

size to set the 200, 250, 300 MHz markers on the three center gradicules. Now set the rest of the pots in the diode shaper until a 1% linearity is obtained. With a calibrated scale, set F_1 at zero and F_2 at 500 MHz. Adjust R724 and R725 until 0 falls on the left edge and 500 MHz falls on right edge of the box pattern. Now with the scale, check calibration of F_2 as it is turned toward F_1 and also F_1 toward F_2. Set F_1 to 100 MHz and R738 and R730 will be set by switching tuning mode to Fo/ΔF. Set blue pointer (Fo) at zero and adjust R738 until zero center frequency appears. Set Fo at 500 MHz and adjust R730 until 500 MHz appears in center. This will require repeat adjustment due to interaction of controls. Set Fo at 250 MHz and F_1 at 500 MHz, adjust R719 for 0 to 500 MHz sweep. Feed in a 60 cycle signal on the gate of Q704 or 7 BR lock/FM input and watch for markers slight shift. If they do, then the external phase lock and FM input works.

4.9 PULSE MARKER BOARD

Install board, B208-049 in Row 3. Set controls as follows:

Tuning mode - F_1-F_2
Sweep interval - F_1-F_2 markers.
Sweep mode - auto
F_1 and F_2 against their stops.
F_3 and F_4 near midrange.
Variable marker - 250 MHz.
Pulse marker size - fully clockwise.

When turned on, three pulses should be present on the trace. If not, adjust F_3, F_4, and variable marker until they are. S641 determines the polarity of the pulse. The unit will be shipped with positive going pulses. The variable marker pulse is approximately 15% smaller in amplitude. Each pulse has two internal pots which determine the range of the pulse. F_3, low, R614, sets the position of the pulse on the left end of the sweep with F_3 (FP) set fully counter-clockwise and F_3, high, R616, sets the position of the pulse on the high end or right end of the trace. The same applies for the corresponding set of pots for F_4 and variable marker. The variable marker and F_3 and F_4 should be checked and set so they will travel the full range.

Set the variable marker pointer (blue) on zero frequency on the scale and adjust R655 until the pulse overlaps zero. Run pointer to 500 MHz and adjust R656 until pulse overlaps 500 MHz birdy. Repeat this adjustment until calibration tracks.

F_3 and F_4 pulses will be set as part of the final setup.

4.10 FINAL SETUP

Allow 15 minutes warm-up time.

Set sweep interval - F_1-F_2/F_3-F_4.

F_1 and F_2 against their respective stops.
F_3 fully counter-clockwise.
F_4 fully clockwise.

The dual trace pattern presentation must overlap so that each birdy lies exactly on top of the other. Some readjustment of adder circuitry, R213, and R209 may be needed to achieve this requirement. To set F_3 and F_4, switch sweep interval to F_3-F_4 and decrease sweep width with F_3 and F_4 around the 50 MHz marker until as narrow as possible and still see a birdy. Now switch sweep interval to F_1-F_2 markers and adjust F_3, low (R614), and F_4, low (R634), until both pulses line up over the 50 MHz birdy. Switch sweep interval back to F_3-F_4 and now decrease the sweep width around 450 MHz birdy with F_3 and F_4. Switch back to F_1-F_2 markers and adjust F_3, high (R615), and F_4, high (R635), until the pulses line up over the 450 MHz markers. Repeat the setup for F_3 and F_4 due to interaction of the internal pots. Now set sweep interval to F_1-F_2 markers and position the markers around zero, and switch to F_3-F_4, and see if the portion between the pulse markers is displayed. Repeat for every 50 MHz birdy marker. The accuracy is $\pm$3% or each marker could be off as much as 30 MHz.

Push marker clip and see if the birdy marker is clipped off. Look at the horizontal waveform and push tilt button, birdy markers should be present on the horizontal triangular waveform.

Double-check:

Sweep mode - line and auto box pattern exactly same size.
Manual sweep travels same range as single sweep.

4.11 VIDEO AMPLIFIER AND OSCILLATOR

These two sections are very critical and if adjustments are required, the adjustments should be made at the factory.

SECTION 5

MAINTENANCE

5.1 INTRODUCTION

As in trouble shooting any electronic equipment, the best approach is to systematically attempt to isolate the problem to a particular circuit, and then a component by the process of elimination. Before attempting to find any failure, it is suggested that the trouble shooting technician or engineer become familiar with the equipment by reading Sections 2 and 3 of this manual. The following section, Section 5.2, presents a trouble shooting chart which lists some of the more common failures. This chart should assist in finding or localizing the defective part. A VTVM and an oscilloscope should be sufficient tools in testing the unit.

5.2 TROUBLE SHOOTING CHART

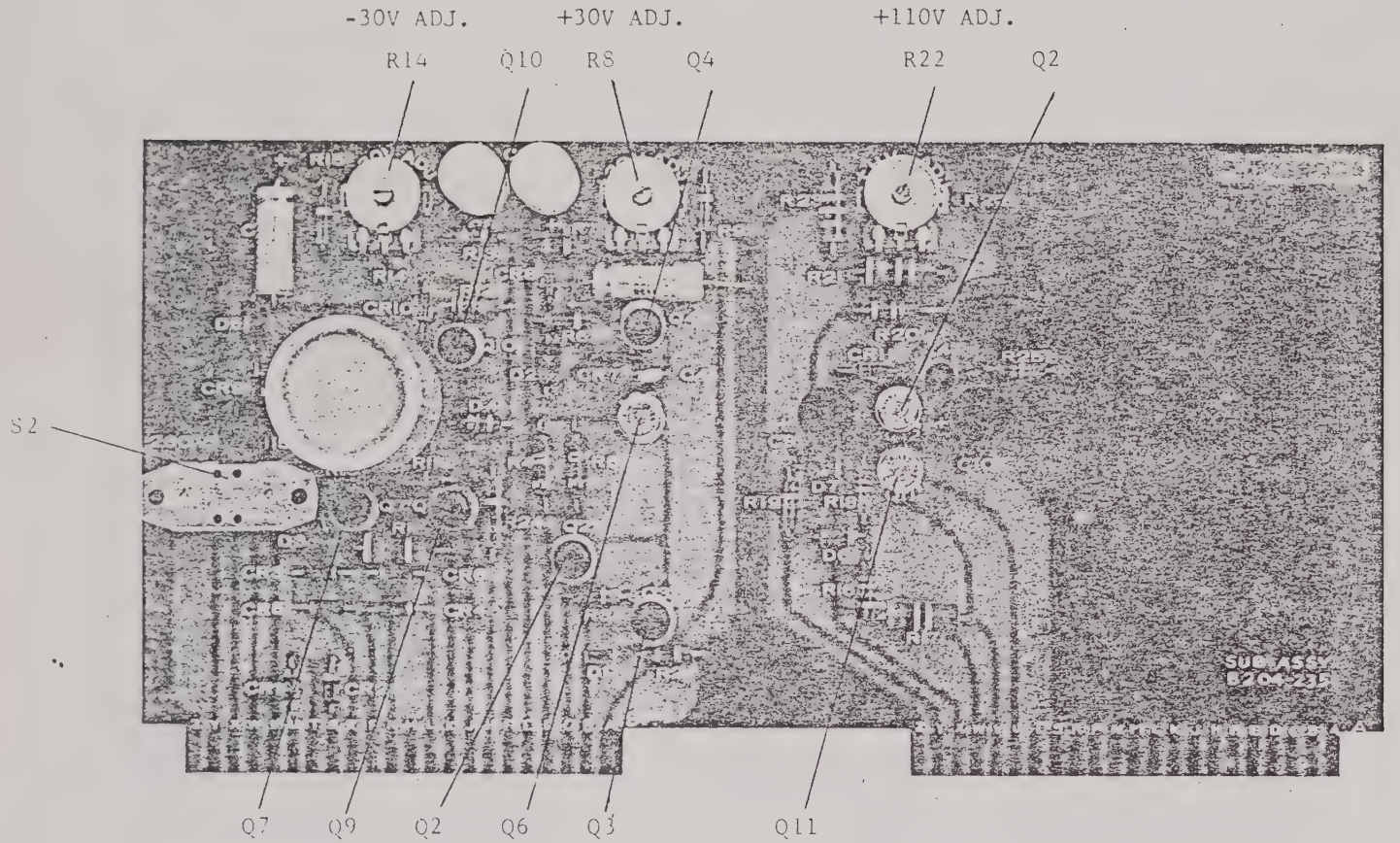
SYMPTOM	CHECK
5.2.1	
Power switch on, but scale does not light	F1, S1
5.2.2	
F1 blows when unit turned on	Power supply transistors; Power supply rectifier (s) shorted; T1
5.2.3	
No RF output	Internal detector; (be sure with external detector before proceeding); power supply voltages; leveler voltage; oscillator or video amplifier transistors
5.2.4	
All pulse markers missing	Q645, S641
F_3 pulse missing	Q601,A-B; Q603,Q604,R809B
F_4 pulse missing	Q621,A-B; Q623,Q624,R810B
Variable marker pulse missing	Q641,A-B; Q643,Q644

SYMPTOM	CHECK
5.2.5	
Dual trace works but dual rate doesn't	Q203
5.2.6	
Dual trace doesn't work but dual rate does	Q201, Q202
5.2.7	
Neither dual trace nor dual rate operate	Q206, Q207; Q208, Q209 if no blanking signal present
5.2.8	
Pen lift relay contact doesn't close	Q212, Q213, Z201, S202
5.2.9	
Video blanking doesn't work but RF blanking does	Q211, S201 not closed
5.2.10	
RF blanking is inoperative	Q208, Q209, Q210, Q456, Q457, D453
5.2.11	
Rate circuit will not function in any mode	Q107,Q109,Q110,Q112,Q113,Q114, D101
5.2.12	
Scope horizontal drive waveform present but no sweep voltage to oscillator	Q108, Q201, Q202, Q701
5.2.13	
Single sweep works but external trigger inoperative	Q101, Q102
5.2.14	
In single sweep or trigger position of mode switch, rate circuit off but won't trigger	Q103, Q104, or R105 needs readjustment

SYMPTOM	CHECK
5.2.15	
RF level vernier doesn't cover correct range	Setting of RF level minimum and maximum controls
5.2.16	
1 KHz modulation inoperative	Q458, Q459
5.2.17	
No output from log amplifier	D452, D451, IC451, IC452
5.2.18	
Very large output from log amplifier with no change when input changed	Q460
5.2.19	
Sweep drive present on R717 wiper but no drive to oscillator	Q702, Q703
5.2.20	
External FM/phase lock inoperative	Q704
5.2.21	
Plug-in marker birdies missing	Q301, Q302, Q303, Q306, Q305
5.2.22	
External marker input produces no birdy	Q304, CR351

SECTION 6

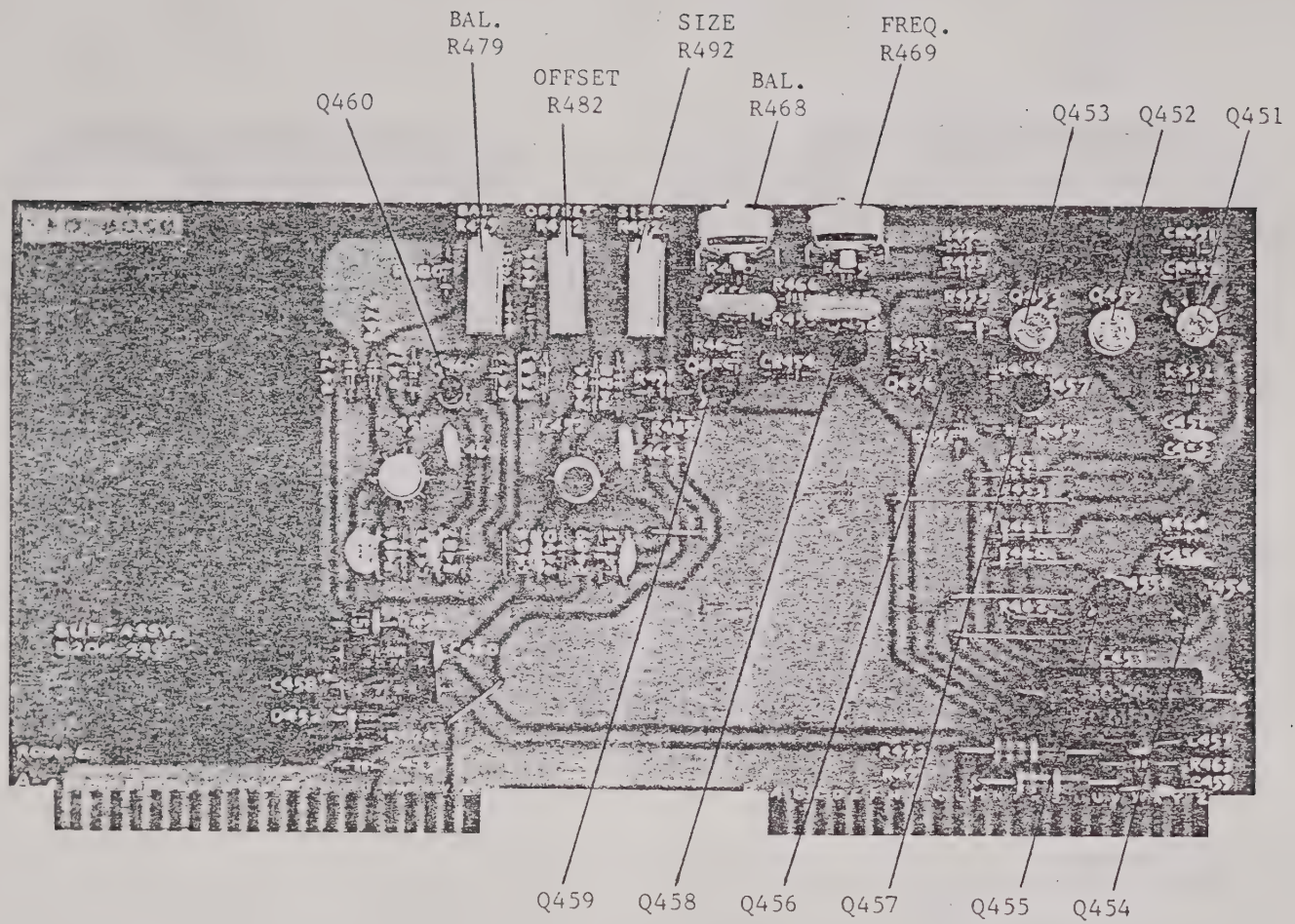
DOCUMENTATION



B204-235

POWER SUPPLY BOARD

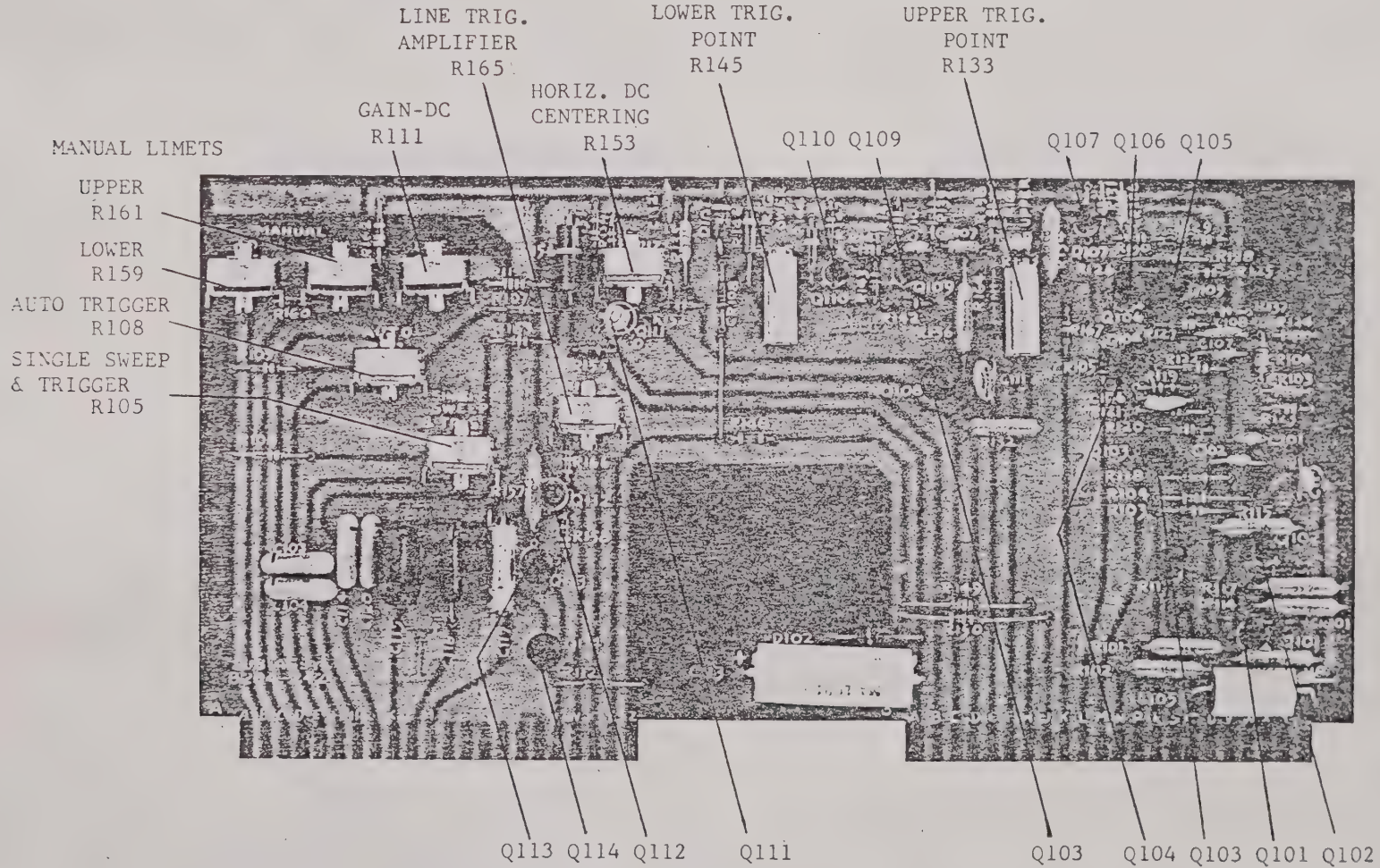
FIGURE 6-1



B204-239

LOG AMPLIFIER & LEVELER BOARD

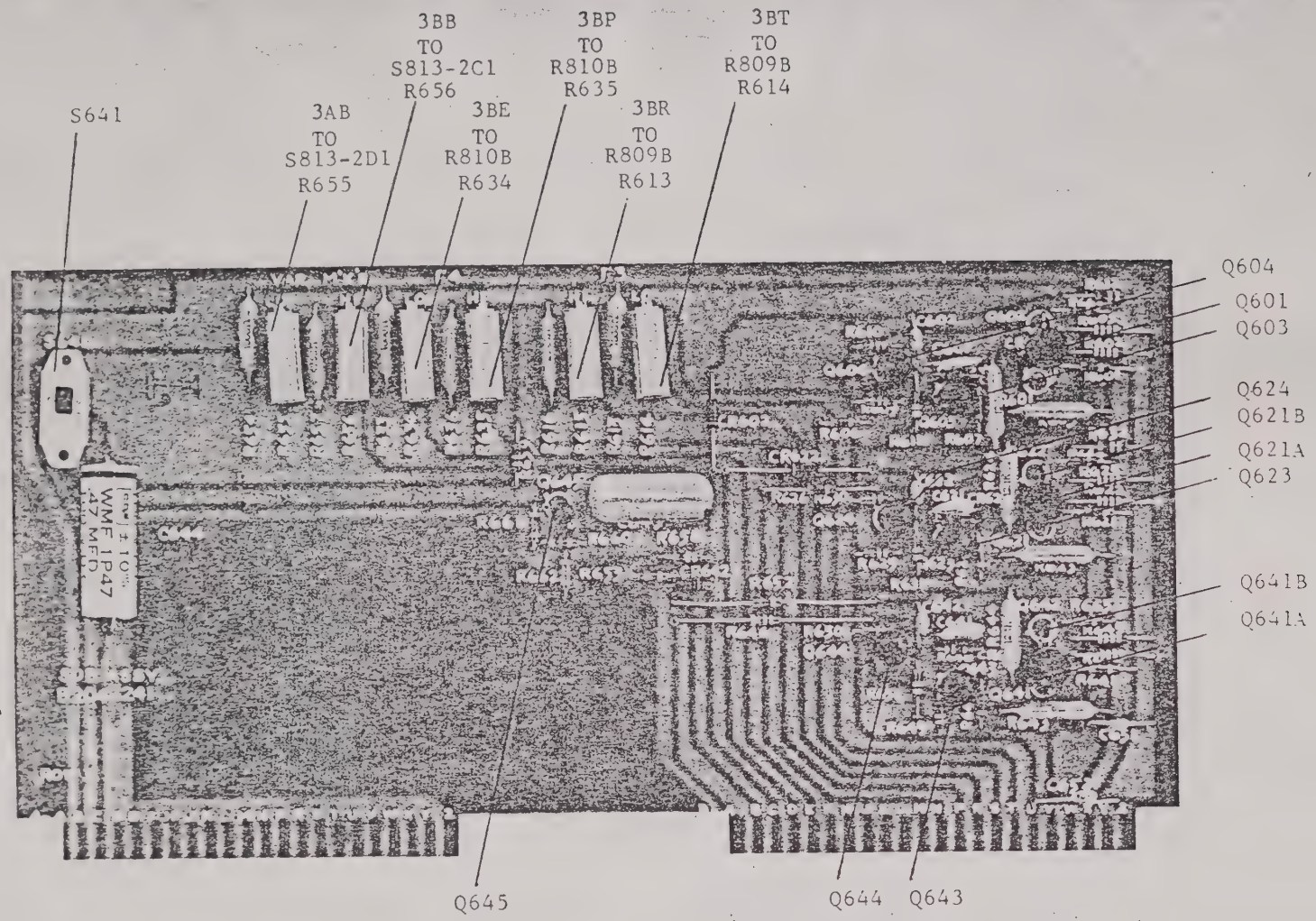
FIGURE 6-3



B204-242

TRIGGER GENERATOR & RATE BOARD

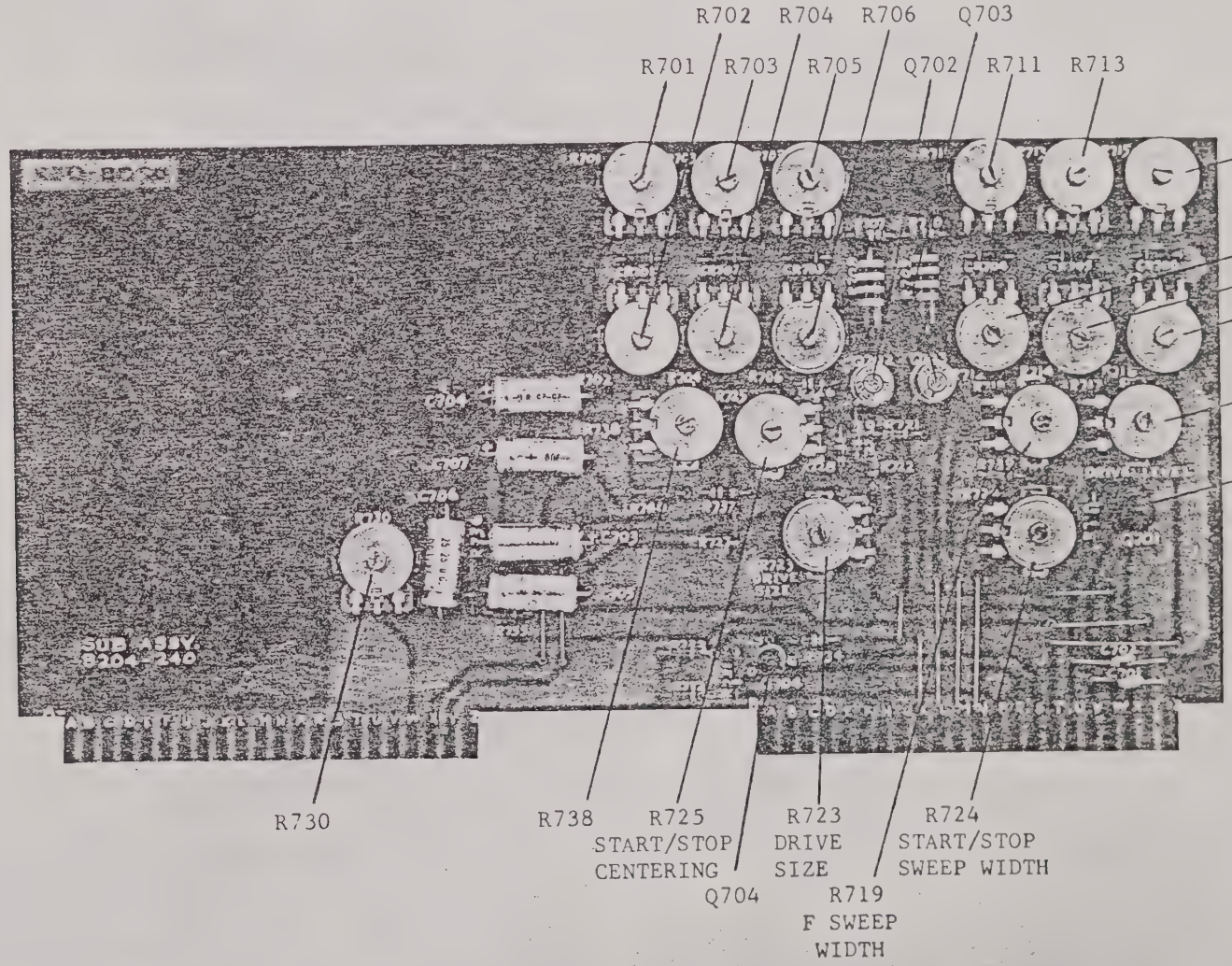
FIGURE 6-4



B204-241

PULSE MARKER BOARD

FIGURE 6-5

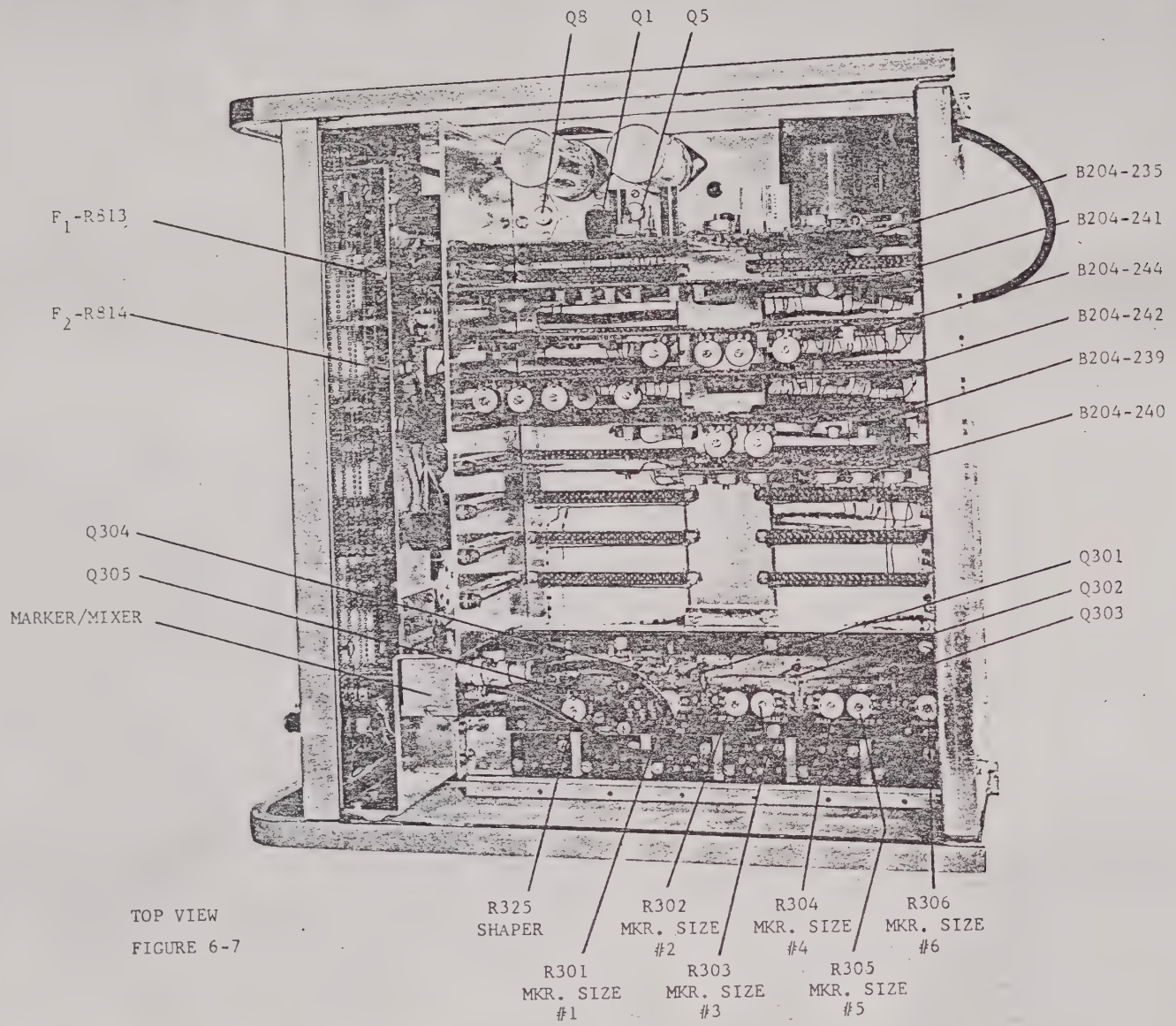


B204-240

LINEARITY BOARD

FIGURE 6-6

1793



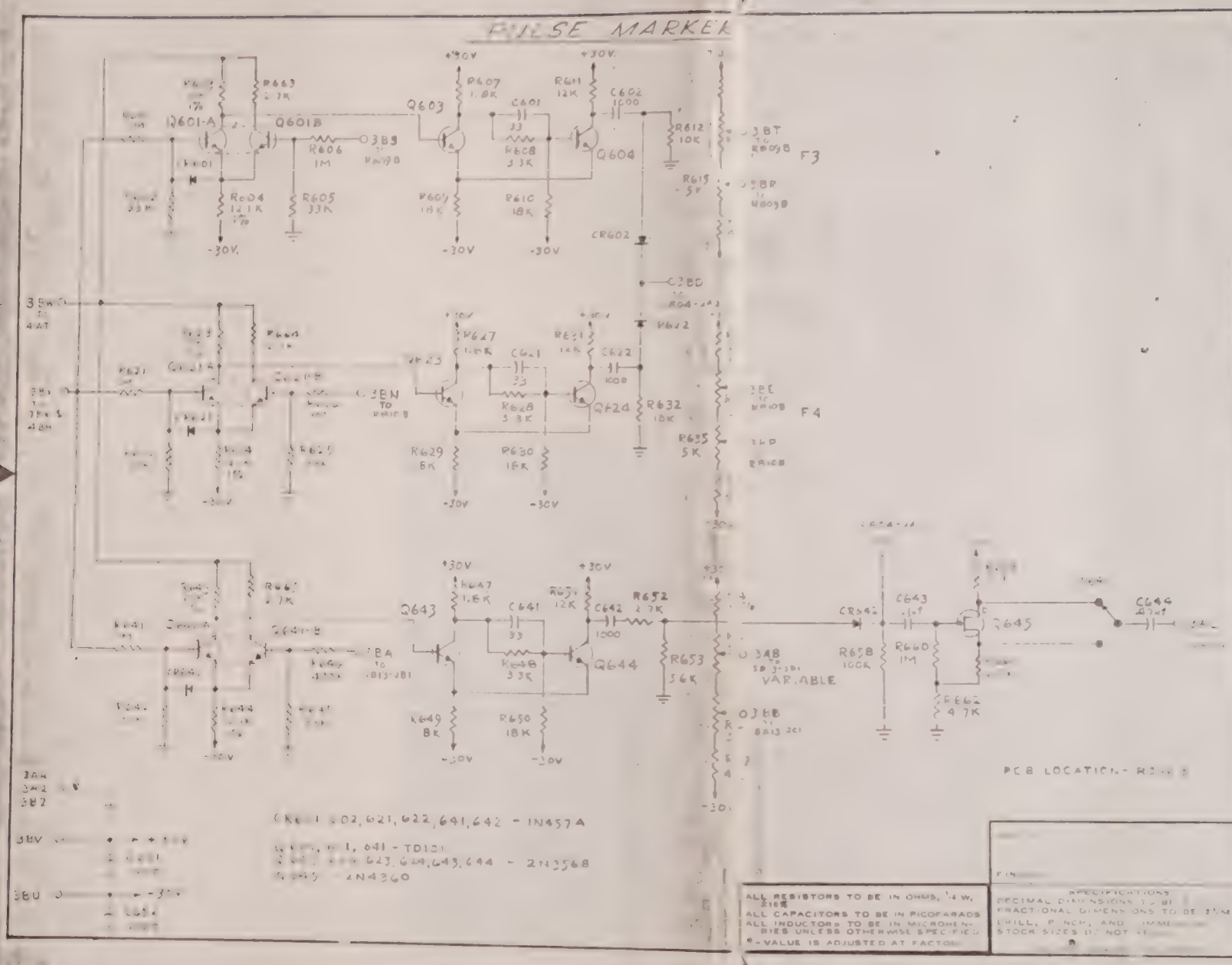
TOP VIEW

FIGURE 6-7

1793

6-7

115V.
1BZ
I 1
I 2
I 3



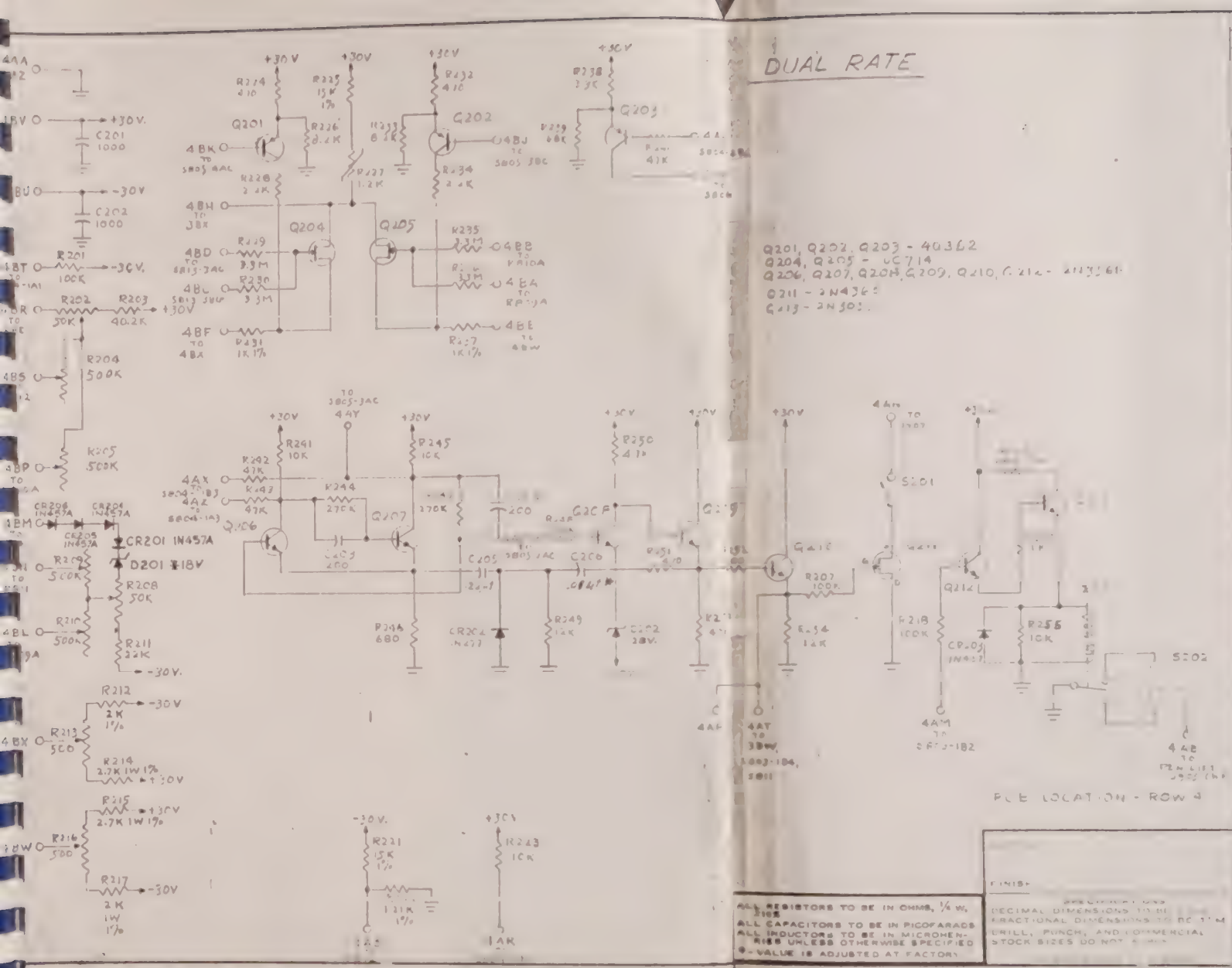
CR601, 602, 621, 622, 641, 642 - IN457A

Q601, 603, 621, 623, 641, 643 - TD131
Q604, 624, 644 - 2N3568
Q645 - 2N4360

ALL RESISTORS TO BE IN OHMS, 1/4 W, 2100
ALL CAPACITORS TO BE IN PICOFARADS
ALL INDUCTORS TO BE IN MICROHENRIES UNLESS OTHERWISE SPECIFIED
* - VALUE IS ADJUSTED AT FACTO

HOLE SCHEDULE

SPECIFICATIONS
DECIMAL DIMENSIONS TO BE
FRACTIONAL DIMENSIONS TO BE
DRILL, PUNCH, AND
STOCK SIZES DO NOT


DUAL RATE
Q201, Q202, Q203 - 40362
Q204, Q205 - UC714
Q206, Q207, Q208, Q209, Q210, Q212 - 2N3565
Q211 - 2N4363
Q213 - 2N3053
+30V
-30V
C201 1000
C202 1000
R201 100K
R202 50K
R203 40.2K
R204 500K
R205 500K
R206 500K
R208 50K
R211 22K
R212 2K 1%
R213 500
R214 2.7K 1W 1%
R215 2.7K 1W 1%
R216 500
R217 2K 1W 1%
R218 100K
R221 15K 1%
R223 121K 1%
R224 1K
R225 15K 1%
R226 8.2K
R227 1.2K
R228 2.4K
R229 68K
R230 3.3M
R231 1K 1%
R232 4.1K
R233 6.8K
R234 2.4K
R235 3.3M
R236 3.3M
R237 1K 1%
R238 2.5K
R239 68K
R240 47K
R241 10K
R242 47K
R243 10K
R244 270K
R245 10K
R246 270K
R247 47K
R248 .22M
R249 12K
R250 47K
R251 680
R252 47K
R254 12K
R255 10K
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CR203 IN457A
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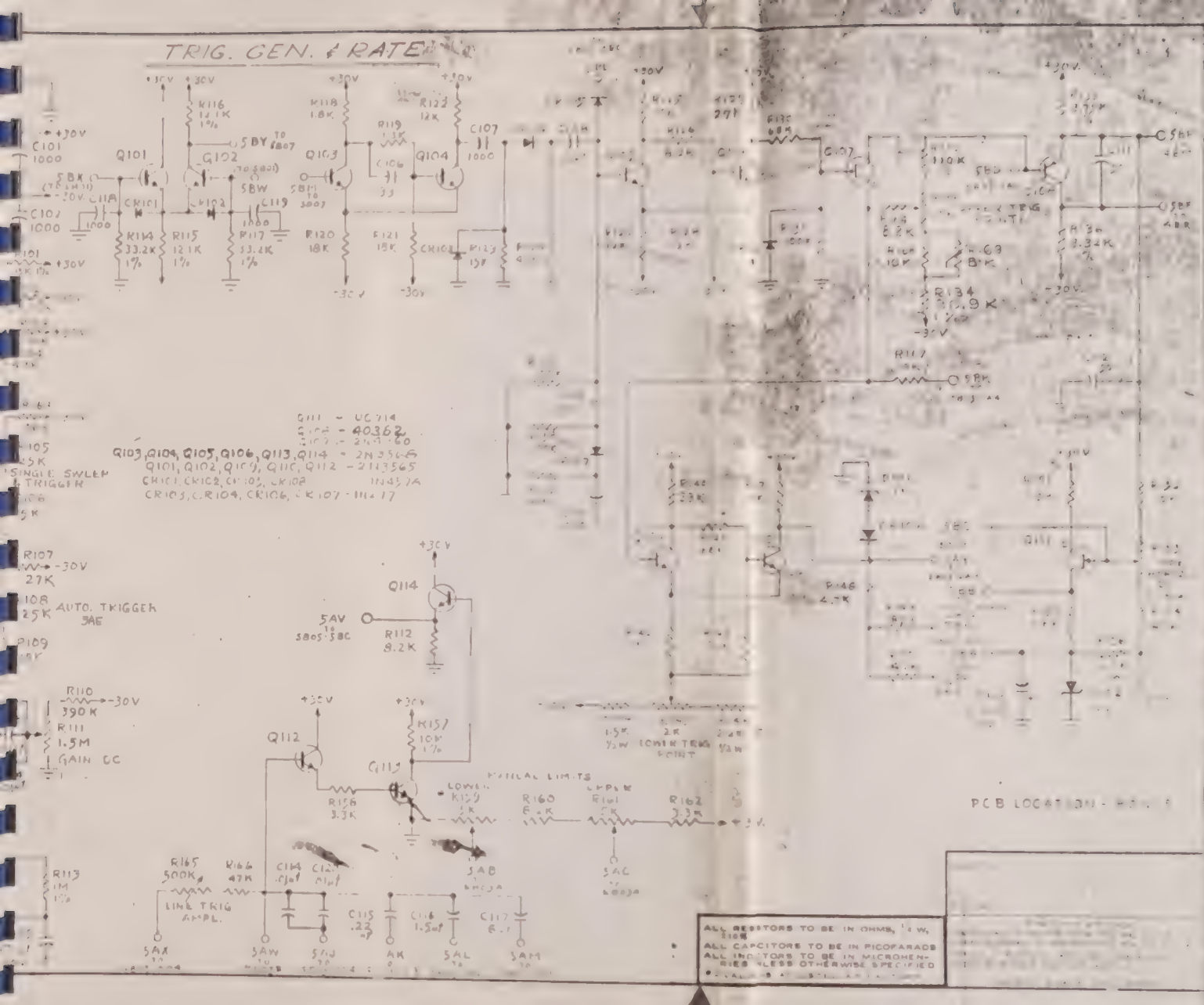
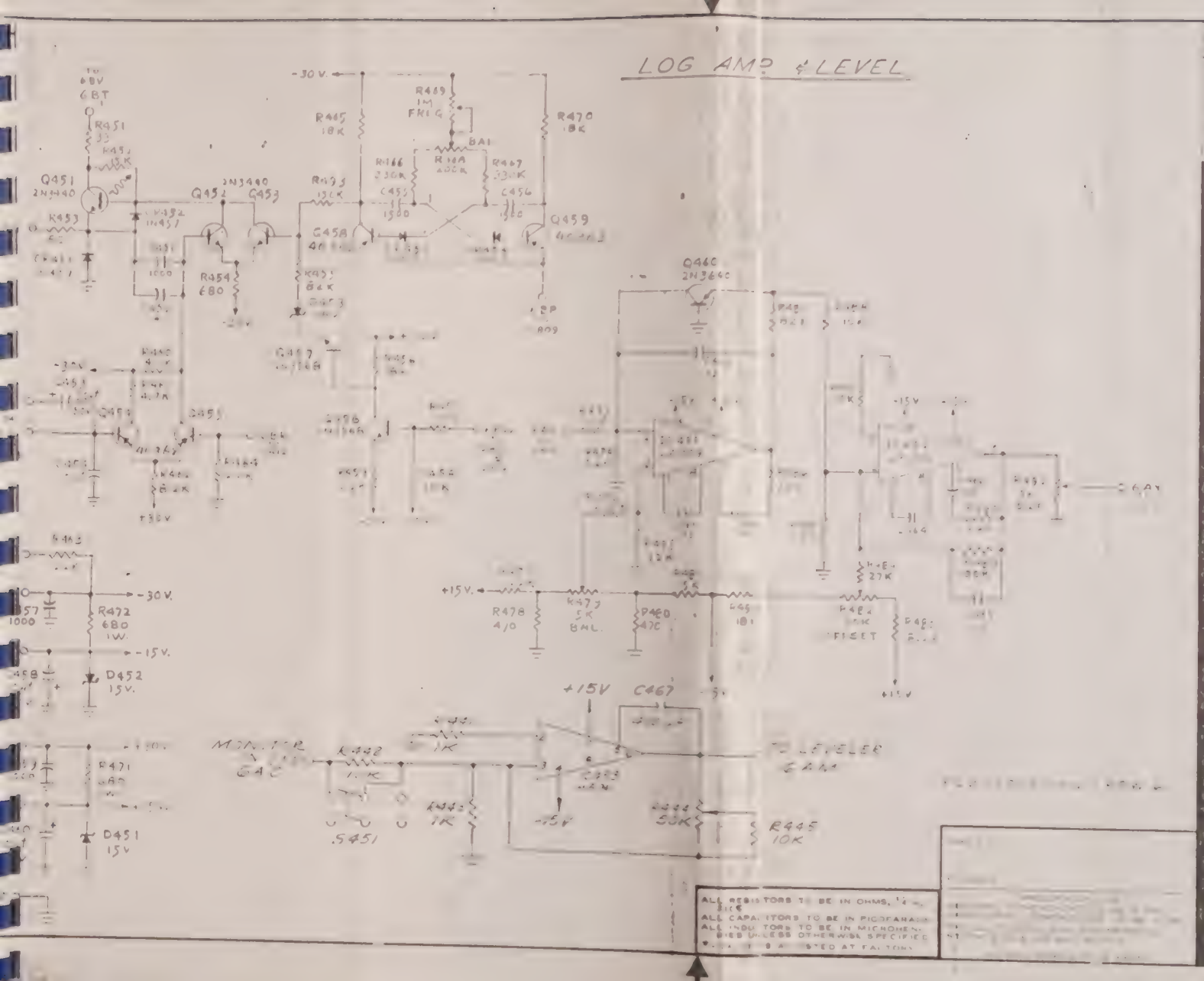
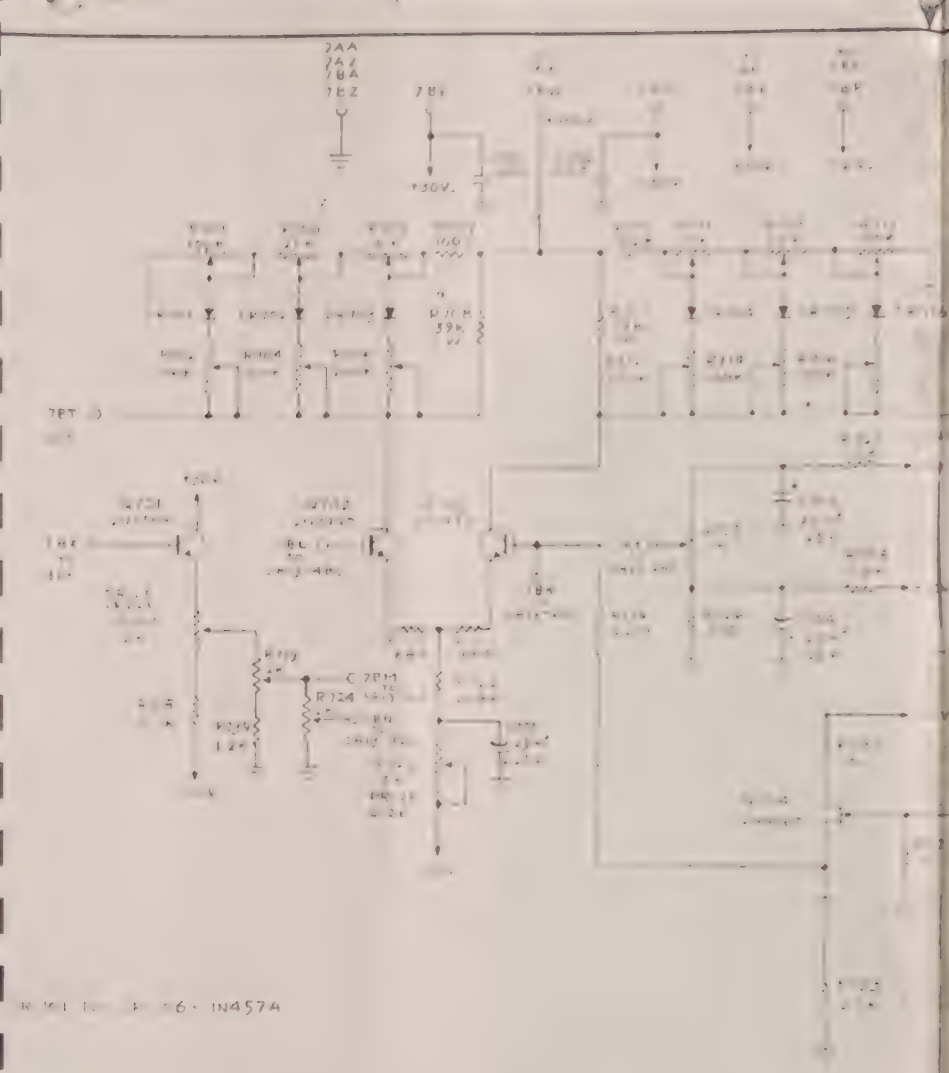
Q213
S201
S202
HOLE SCHEDULE
HOLE
DESCRIPTION
QTY
ALL RESISTORS TO BE IN OHMS, 1/4 W, 5%
ALL CAPACITORS TO BE IN PICOFARADS
ALL INDUCTORS TO BE IN MICROHENRIES UNLESS OTHERWISE SPECIFIED
* - VALUE IS ADJUSTED AT FACTORY
FINISH
DECIMAL DIMENSIONS TO BE
FRACTIONAL DIMENSIONS TO BE
DRILL, PUNCH, AND COMMERCIAL STOCK SIZES DO NOT
PCB LOCATION - ROW 4


TRIG. GEN. & RATE
Q101 = UC 714
Q102 = 40362
Q103, Q104, Q105, Q106, Q113, Q114 = 2N3565
Q101, Q102, Q109, Q110, Q112 = 2N3565
CR101, CR102, CR103, CR108 IN457A
CR105, CR104, CR106, CR107 = IN417
SINGLE SWEEP & TRIGGER
AUTO. TRIGGER
LOWER TRIG POINT
GAIN DC
LINE TRIG AMPL.
PCB LOCATION
ALL RESISTORS TO BE IN OHMS, ½ W, 5%
ALL CAPACITORS TO BE IN PICOFARADS
ALL INDUCTORS TO BE IN MICROHENRIES UNLESS OTHERWISE SPECIFIED

LOG AMP & LEVEL



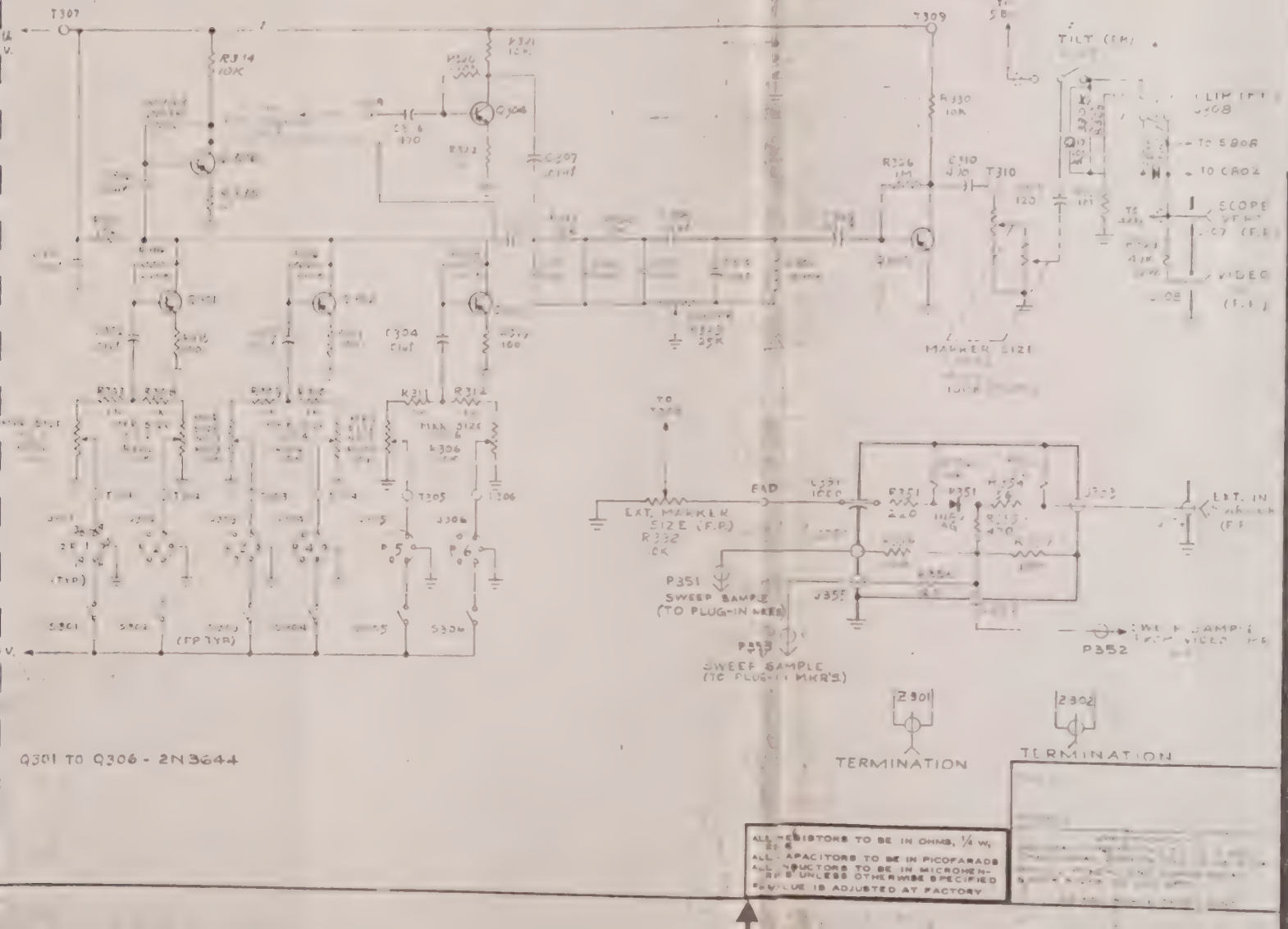
ALL RESISTORS TO BE IN OHMS, ½ WATT UNLESS OTHERWISE SPECIFIED
ALL CAPACITORS TO BE IN PICOFARADS
ALL INDUCTORS TO BE IN MICROHENRIES UNLESS OTHERWISE SPECIFIED
[illegible] ADJUSTED AT FACTORY



LINEARITY

- RESISTORS TO BE IN OHMS, ½ W, 10%
- CAPACITORS TO BE IN PICOFARADS
- INDUCTORS TO BE IN MICROHENRIES UNLESS OTHERWISE SPECIFIED
- VALUE IS ADJUSTED AT FACTORY

BIRDY AMP.

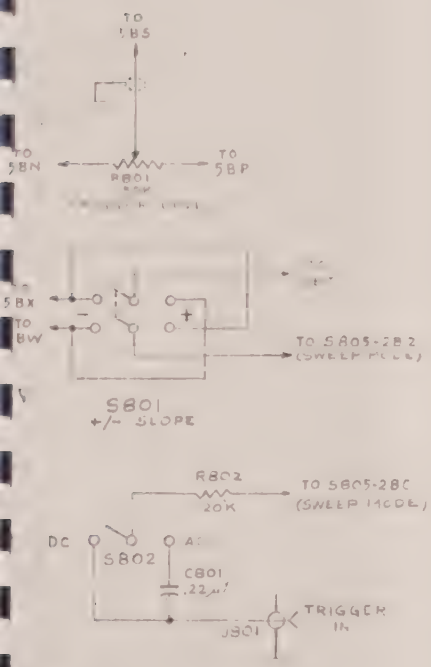


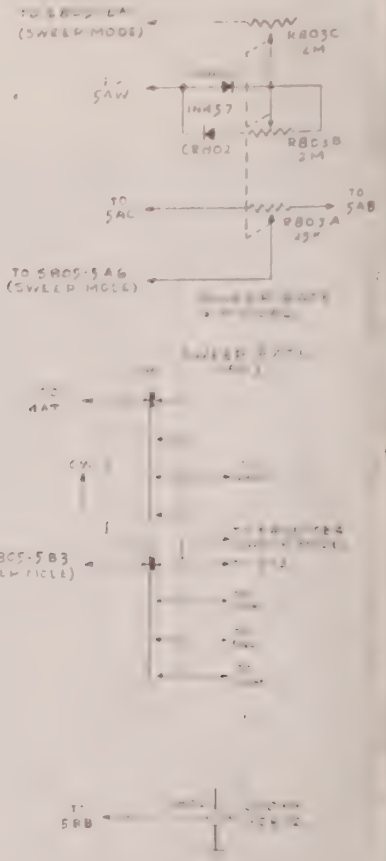
Q301 TO Q306 - 2N3644

ALL RESISTORS TO BE IN OHMS, ¼ W, 2% ±
ALL CAPACITORS TO BE IN PICOFARADS
ALL INDUCTORS TO BE IN MICROHENRIES UNLESS OTHERWISE SPECIFIED
* VALUE IS ADJUSTED AT FACTORY

ATTENUATOR
P602
P603
Z601
0-70 db
10 db STEPS
Z602
0-10 db
1 db STEPS
P601
P604
J602
RF OUT
OSCILLATOR
BLANKED BY FROM S.P.P.
VVC DRIVE FROM SBS
VIDEO AMPLIFIER
LEVELLER
Z501
LO PASS FILTER
LO
TO

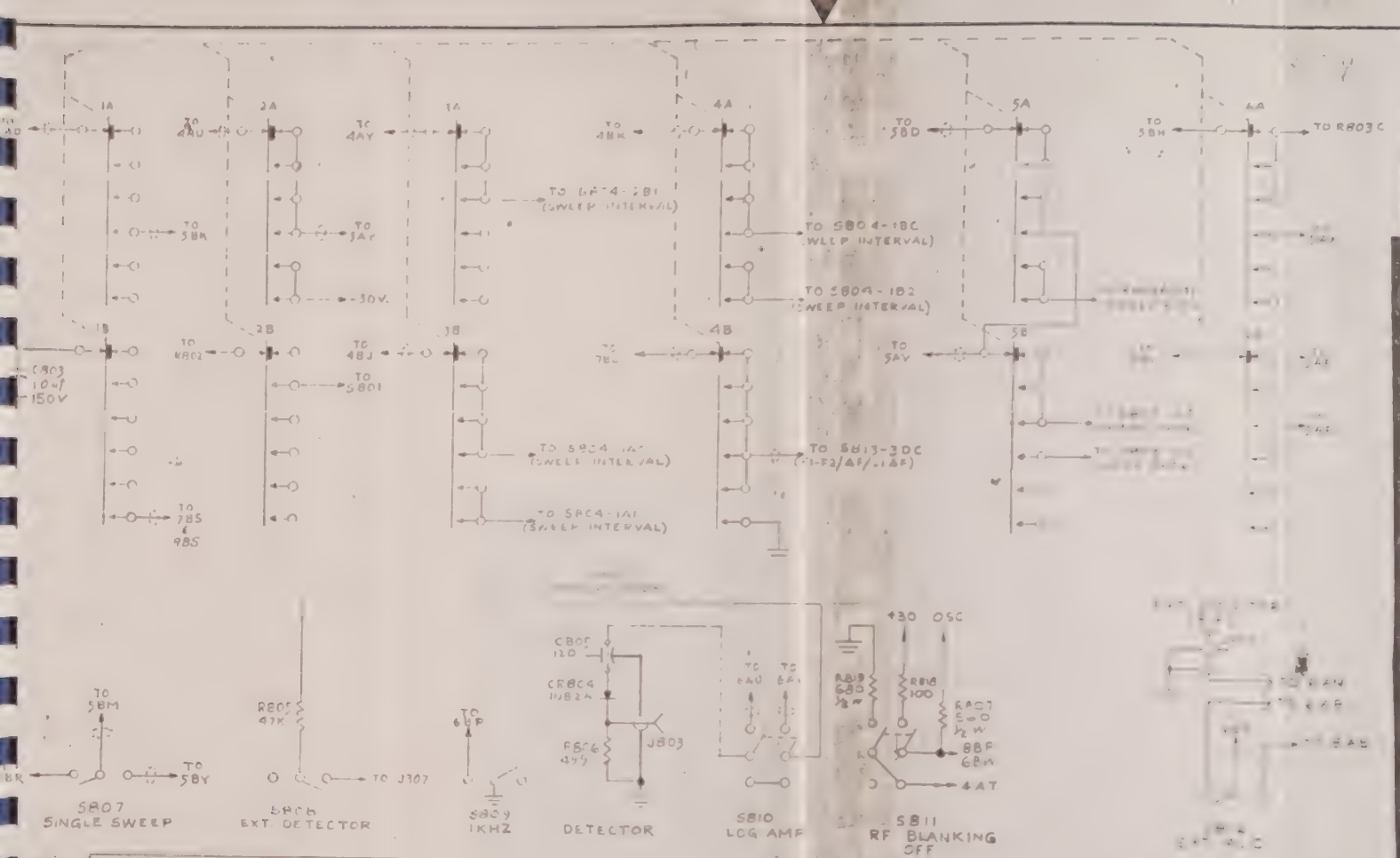
PANEL CONTROLS





MOLE	DESCRIPTION	DATE

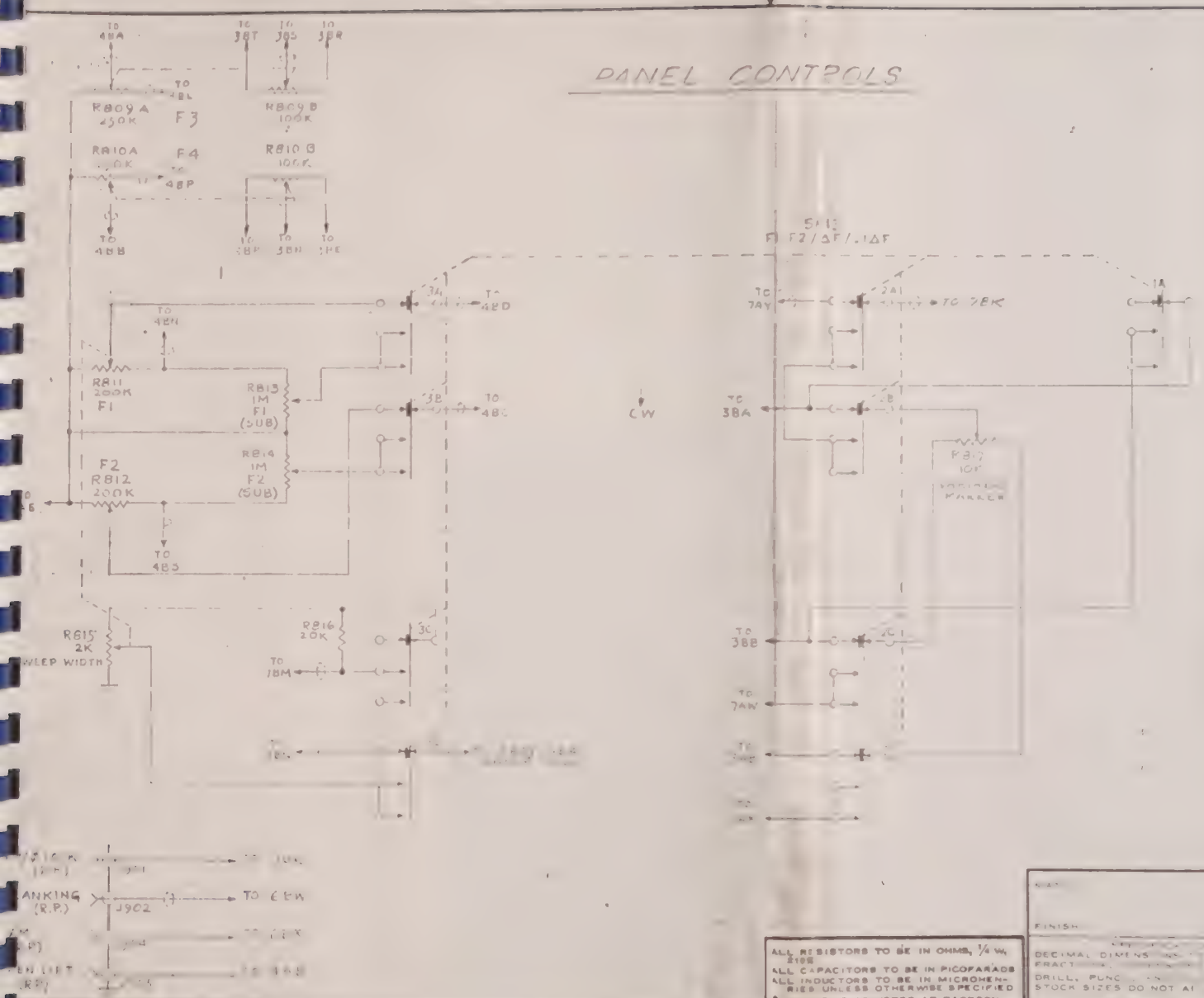
ALL RESISTORS TO BE IN OHMS, 1/2 W, ±10%
ALL CAPACITORS TO BE IN PICOFARADS
ALL INDUCTORS TO BE IN MICROHENRIES UNLESS OTHERWISE SPECIFIED
* VALUE IS ADJUSTED AT FACTORY



HOLE SCHEDULE		
HOLE	DESCRIPTION	QTY.

ALL RESISTORS TO BE IN OHMS, 1/4 W, 5%
ALL CAPACITORS TO BE IN PICOFARADS
ALL INDUCTORS TO BE IN MICROHENRIES UNLESS OTHERWISE SPECIFIED
*-VALUE IS ADJUSTED AT FACTORY

PANEL CONTROLS



HOLE SCHEDULE		
HOLE	DESCRIPTION	QTY.

ALL RESISTORS TO BE IN OHMS, 1/4 W, 2100
ALL CAPACITORS TO BE IN PICOFARADS
ALL INDUCTORS TO BE IN MICROHENRIES UNLESS OTHERWISE SPECIFIED
* = VALUE IS ADJUSTED AT FACTORY

FINISH

DECIMAL DIMENS
FRACT
DRILL, PUNC
STOCK SIZES DO NOT AL

JUMPERS

WIRING & JUMPERS NOT INCLUDED ON SHEET 3 THRU 7 OF P.C.B. 5004118

HOLE SCHEDULE

SYMBOL	DESCRIPTION	QTY

ALL RESISTORS TO BE IN OHMS, 1/4 W, 5%
ALL CAPACITORS TO BE IN PICOFARADS
ALL INDUCTORS TO BE IN MICROHENRIES UNLESS OTHERWISE SPECIFIED
* VALUE IS ADJUSTED AT FACTORY

DO NOT SCALE THIS PRINT

CIRCUIT REF. NO.	TEXSCAN STOCK NO.	DESCRIPTION	MFG., MFG. PART NO.
C1	012-075	Capacitor,Fixed, 20/300V,80/300V, 200/150V,20/300V	Mallory WP419.39A
C2	012-159	Capacitor,Fixed, 80/400V,40/400V, 150/50V	Mallory FP333.3A
C3	012-082	Capacitor,Fixed, 50uf,50V	Mallory MFV50DE50
C4	012-009	Capacitor,Fixed, 1000pf	RMC SM.001
C5	012-015	Capacitor,Fixed, 100uf,12V	Sprague 30D1076012DC4
C6	012-079	Capacitor,Fixed, 100uf,150V	Mallory FP116A
C7	012-015	Capacitor,Fixed, 100uf,12V	Sprague 30D1076012DC4
C8	012-082	Capacitor,Fixed, 50uf,50V	Mallory MFV50DE50
C11	012-051	Capacitor,Fixed, .22uf,200V	Cornell-Dubilier 2P22
C101	012-009	Capacitor,Fixed, 1000pf	RMC SM.001
C102	012-009	Capacitor,Fixed, 1000pf	RMC SM.001
C103	012-066	Capacitor,Fixed, .01uf	Sprague 22SP10391
C104	012-066	Capacitor,Fixed, .01uf	Sprague 22SP10391
C105	012-152	Capacitor,Fixed, .47uf,200V	TRW
C106	012-084	Capacitor,Fixed, 33pf	RMC 33NPO
C107	012-009	Capacitor,Fixed, 1000pf	RMC SM.001
C108	012-050	Capacitor,Fixed, .01uf	RMC TA.01
C109	012-033	Capacitor,Fixed, 470pf	RMC Type TA
C110	012-009	Capacitor,Fixed, 1000pf	RMC SM.001
C111	012-012	Capacitor,Fixed, 50pf	RMC N-750
C112	012-012	Capacitor,Fixed, 50pf	RMC N-750
C113	012-113	Capacitor,Fixed, 350uf,15V	Mallory MTA350F15
C114	012-066	Capacitor,Fixed, .01uf	Sprague 22SP10391
C115	012-020	Capacitor,Fixed, .22uf,100V	Cornell-Dubilier DMF 1P22
C116	012-155	Capacitor,Fixed, 1.5uf	Kemet KIR5C35K
C117	012-162	Capacitor,Fixed, 8uf	Sprague TE1303.3
C118	012-009	Capacitor,Fixed, 1000pf	RMC SM.001
C119	012-009	Capacitor,Fixed, 1000pf	RMC SM.001
C120	012-066	Capacitor,Fixed, .01uf	Sprague 22SP10391
C201	012-009	Capacitor,Fixed, 1000pf	RMC SM.001
C202	012-009	Capacitor,Fixed, 1000pf	RMC SM.001
C203	012-052	Capacitor,Fixed, 200pf	RMC Type C N1500
C204	012-052	Capacitor,Fixed, 200pf	RMC Type C N1500
C205	012-020	Capacitor,Fixed, .22uf,100V	Cornell-Dubilier DMF 1P22

REF. NO.	STOCK NO.		
C206	012-005	Capacitor,Fixed, .01uf	RMC 185V.01
C301	012-050	Capacitor,Fixed, .01uf,100V	RMC TA.01
C302	012-050	Capacitor,Fixed, .01uf,100V	RMC TA.01
C303	012-050	Capacitor,Fixed, .01uf,100V	RMC TA.01
C304	012-050	Capacitor,Fixed, .01uf,100V	RMC TA.01
C305	012-050	Capacitor,Fixed, .01uf,100V	RMC TA.01
C306	012-050	Capacitor,Fixed, .01uf,100V	RMC TA.01
C307	012-050	Capacitor,Fixed, .01uf,100V	RMC TA.01
C308	012-050	Capacitor,Fixed, .01uf,100V	RMC TA.01
C309	012-050	Capacitor,Fixed, .01uf,100V	RMC TA.01
C310	012-050	Capacitor,Fixed, .01uf,100V	RMC TA.01
C311	012-009	Capacitor,Fixed, 1000pf	RMC SM.001
C312	012-009	Capacitor,Fixed, 1000pf	RMC SM.001
C313	012-009	Capacitor,Fixed, 1000pf	RMC SM.001
C314	012-009	Capacitor,Fixed, 1000pf	RMC SM.001
C315	012-150	Capacitor,Fixed, 120pf	Centralab DD-121
C316	012-050	Capacitor,Fixed, .01uf,100V	RMC TA.01
C317	012-050	Capacitor,Fixed, .01uf,100V	RMC TA.01
C351	012-001	Capacitor,Fixed, 1000pf Feed-thru	Allen Bradley FA5C
C401	012-010	Capacitor,Fixed, 3pf,1000V	RMC TC-NPO
C402	015-009	Capacitor,Variable, 8-60pf	Arco 404
C403	012-009	Capacitor,Fixed, 1000pf	RMC SM.001
C404	012-011	Capacitor,Fixed, 10pf	RMC TC-NPO
C405	012-050	Capacitor,Fixed, .01uf,100V	RMC TA.01
C406	012-089	Capacitor,Fixed, 2pf,500V	Quality Components MC2.0
C407*		Factory Selected Value	
C408	015-009	Capacitor,Variable, 8-60pf	Arco 404
C409*		Factory Selected Value	
C410*		Factory Selected Value	
C411*		Factory Selected Value	
C412	012-050	Capacitor,Fixed, .01uf,100V	RMC TA.01
C413	012-089	Capacitor,Fixed, 2pf,500V	Quality Components MC2.0
C414	012-092	Capacitor,Fixed, 5pf,1000V	RMC Type C
C415	015-009	Capacitor,Variable, 8-60pf	Arco 404
C416	012-005	Capacitor,Fixed, .01uf	RMC Z5U.01
C417	012-009	Capacitor,Fixed, 1000pf	RMC SM.001

CIRCUIT REF. NO.	TEXSCAN STOCK NO.	DESCRIPTION	MFG., MFG. PART NO.
C418	012-156	Capacitor,Fixed, 47pf,1000V	Centralab
C419	012-005	Capacitor,Fixed, .01uf	RMC Z5U.01
C420	012-010	Capacitor,Fixed, 3pf,1000V	RMC TC-NPO
C421	012-011	Capacitor,Fixed, 10pf	RMC TC-NPO
C422	015-009	Capacitor,Variable, 8-60pf	Arco 404
C423	012-085	Capacitor,Fixed, .005uf,100V	RMC SM.005
C424	012-005	Capacitor,Fixed, .01uf	RMC Z5U.01
C425	012-001	Capacitor,Fixed, 1000pf Feed-thru	Allen Bradley FA5C
C426	012-001	Capacitor,Fixed, 1000pf Feed-thru	Allen Bradley FA5C
C427	012-001	Capacitor,Fixed, 1000pf Feed-thru	Allen Bradley FA5C
C428	012-001	Capacitor,Fixed, 1000pf Feed-thru	Allen Bradley FA5C
C429	012-001	Capacitor,Fixed, 1000pf Feed-thru	Allen Bradley FA5C
C431	012-001	Capacitor,Fixed, 1000pf Feed-thru	Allen Bradley FA5C
C432	012-001	Capacitor,Fixed, 1000pf Feed-thru	Allen Bradley FA5C
C433	012-001	Capacitor,Fixed, 1000pf Feed-thru	Allen Bradley FA5C
C434	012-001	Capacitor,Fixed, 1000pf Feed-thru	Allen Bradley FA5C
C435	012-058	Capacitor,Fixed, 120pf Feed-thru	Allen Bradley FA5C
C451	012-009	Capacitor,Fixed, 1000pf	RMC SM.001
C452	012-009	Capacitor,Fixed, 1000pf	RMC SM.001
C453	012-027	Capacitor,Fixed, 50uf,50V	Cornell-Dubilier BR50-50
C454	012-050	Capacitor,Fixed, .01uf,100V	RMC TA.01
C455	012-069	Capacitor,Fixed, 1500pf	Sprague 225P15291
C456	012-069	Capacitor,Fixed, 1500pf	Sprague 225P15291
C457	012-009	Capacitor,Fixed, 1000pf	RMC SM.001
C458	012-087	Capacitor,Fixed, 10uf,25V	Sprague 31D87
C459	012-009	Capacitor,Fixed, 1000pf	RMC SM.001
C460	012-087	Capacitor,Fixed, 10uf,25V	Sprague 31D87
C461	012-084	Capacitor,Fixed, 33pf	RMC 33NPO
C462	012-013	Capacitor,Fixed, 120pf	RMC Type C N1500
C463	012-083	Capacitor,Fixed, 12pf	RMC 12NPO
C464	012-084	Capacitor,Fixed, 33pf	RMC 33NPO
C465	012-103	Capacitor,Fixed, 15pf	RMC Type C NPO
C466	012-013	Capacitor,Fixed, 1000pf Feed-thru	Allen Bradley FA5C
C501	012-001	Capacitor,Fixed, 1000pf Feed-thru	Allen Bradley FA5C
C502	012-118	Capacitor,Fixed, 100pf,300V	JFD FCJ-81
C503	012-001	Capacitor,Fixed, 1000pf Feed-thru	Allen Bradley FA5C

CIRCUIT REF. NO.	TEXSCAN STOCK NO.	DESCRIPTION	MFG., MFG. PART NO.
C504	012-001	Capacitor,Fixed, 1000pf Feed-thru	Allen Bradley FA5C
C505	012-001	Capacitor,Fixed, 1000pf Feed-thru	Allen Bradley FA5C
C506	012-118	Capacitor,Fixed, 1000pf,300V	JFD FCJ-81
C507	012-001	Capacitor,Fixed, 1000pf Feed-thru	Allen Bradley FA5C
C508	012-001	Capacitor,Fixed, 1000pf Feed-thru	Allen Bradley FA5C
C509	012-070	Capacitor,Fixed, 1.8pf,500V	Quality Components
C510	012-085	Capacitor,Fixed, .005uf,100V	RMC SM.005
C511	012-150	Capacitor,Fixed, 120pf,1000V	Centralab Type DD-121
C512	012-092	Capacitor,Fixed, 5pf,1000V	RMC Type C
C513	012-010	Capacitor,Fixed, 3pf,50V	RMC TC-NPO
C601	012-084	Capacitor,Fixed, 33pf	RMC 33NPO
C602	012-009	Capacitor,Fixed, 1000pf	RMC SM.001
C621	012-084	Capacitor,Fixed, 33pf	RMC 33NPO
C622	012-009	Capacitor,Fixed, 1000pf	RMC SM.001
C641	012-084	Capacitor,Fixed, 33pf	RMC 33NPO
C642	012-009	Capacitor,Fixed, 1000pf	RMC SM.001
C643	012-101	Capacitor,Fixed, .1uf	Sprague ZPS-P10
C644	012-105	Capacitor,Fixed, .47uf	Cornell-Dubilier WMP1P47
C651	012-009	Capacitor,Fixed, 1000pf	RMC SM.001
C652	012-009	Capacitor,Fixed, 1000pf	RMC SM.001
C701	012-009	Capacitor,Fixed, 1000pf	RMC SM.001
C702	012-009	Capacitor,Fixed, 1000pf	RMC SM.001
C703	012-064	Capacitor,Fixed, 25uf,25V	Sprague TE1207
C704	012-064	Capacitor,Fixed, 25uf,25V	Sprague TE1207
C705	012-064	Capacitor,Fixed, 25uf,25V	Sprague TE1207
C706	012-064	Capacitor,Fixed, 25uf,25V	Sprague TE1207
C707	012-064	Capacitor,Fixed, 25uf,25V	Sprague TE1207
C801	012-020	Capacitor,Fixed, 22uf,100V	Cornell-Dubilier DM1P22
C802	012-030	Capacitor,Fixed, 27pf	Centralab 1P270
C803	012-155	Capacitor,Fixed, 1.5uf	RMC TC-NPO
CR1	025-044	Diode, 800V	Sarkes Tarzian E-8
CR2	025-044	Diode, 800V	Sarkes Tarzian E-8
CR3	025-007	Diode, 400V	General Electric A13DZ
CR4	025-007	Diode, 400V	General Electric A13DZ
CR5	025-007	Diode, 400V	General Electric A13DZ
CR6	025-007	Diode, 400V	General Electric A13DZ

CIRCUIT REF. NO.	TEXSCAN STOCK NO.	DESCRIPTION	MFG., MFG. PART NO.
CR7	025-034	Diode, 1N457A	Sylvania 1N457A
CR8	025-034	Diode, 1N457A	Sylvania 1N457A
CR9	025-034	Diode, 1N457A	Sylvania 1N457A
CR10	025-034	Diode, 1N457A	Sylvania 1N457A
CR11	025-034	Diode, 1N457A	Sylvania 1N457A
CR101	025-034	Diode, 1N457A	Sylvania 1N457A
CR102	025-034	Diode, 1N457A	Sylvania 1N457A
CR103	025-012	Diode, 1N277	Sylvania 1N277
CR104	025-012	Diode, 1N277	Sylvania 1N277
CR105	025-034	Diode, 1N457A	Sylvania 1N457A
CR106	025-012	Diode, 1N277	Sylvania 1N277
CR107	025-012	Diode, 1N277	Sylvania 1N277
CR108	025-034	Diode, 1N457A	Sylvania 1N457A
CR201	025-034	Diode, 1N457A	Sylvania 1N457A
CR202	025-012	Diode, 1N277	Sylvania 1N277
CR203	025-034	Diode, 1N457A	Sylvania 1N457A
CR204	025-034	Diode, 1N457A	Sylvania 1N457A
CR205	025-034	Diode, 1N457A	Sylvania 1N457A
CR206	025-034	Diode, 1N457A	Sylvania 1N457A
CR301	025-034	Diode, 1N457A	Sylvania 1N457A
CR351	025-002	Diode, 1N82AG	Sylvania 1N82AG
CR401	025-016	Diode, HD5003	Hughes HD5003
CR451	025-034	Diode, 1N457A	Sylvania 1N457A
CR452	025-034	Diode, 1N457A	Sylvania 1N457A
CR453	025-034	Diode, 1N457A	Sylvania 1N457A
CR454	025-034	Diode, 1N457A	Sylvania 1N457A
CR501	025-028	Diode, 1N25	Sylvania 1N25
CR601	025-034	Diode, 1N457A	Sylvania 1N457A
CR602	025-034	Diode, 1N457A	Sylvania 1N457A
CR621	025-034	Diode, 1N457A	Sylvania 1N457A
CR622	025-034	Diode, 1N457A	Sylvania 1N457A
CR641	025-034	Diode, 1N457A	Sylvania 1N457A
CR642	025-034	Diode, 1N457A	Sylvania 1N457A
CR701	025-034	Diode, 1N457A	Sylvania 1N457A
CR702	025-034	Diode, 1N457A	Sylvania 1N457A
CR703	025-034	Diode, 1N457A	Sylvania 1N457A
CR704	025-034	Diode, 1N457A	Sylvania 1N457A

CIRCUIT REF. NO.	TEXSCAN STOCK NO.	DESCRIPTION	MFG., MFG. PART NO.
CR7	025-034	Diode, 1N457A	Sylvania 1N457A
CR8	025-034	Diode, 1N457A	Sylvania 1N457A
CR9	025-034	Diode, 1N457A	Sylvania 1N457A
CR10	025-034	Diode, 1N457A	Sylvania 1N457A
CR11	025-034	Diode, 1N457A	Sylvania 1N457A
CR101	025-034	Diode, 1N457A	Sylvania 1N457A
CR102	025-034	Diode, 1N457A	Sylvania 1N457A
CR103	025-012	Diode, 1N277	Sylvania 1N277
CR104	025-012	Diode, 1N277	Sylvania 1N277
CR105	025-034	Diode, 1N457A	Sylvania 1N457A
CR106	025-012	Diode, 1N277	Sylvania 1N277
CR107	025-012	Diode, 1N277	Sylvania 1N277
CR108	025-034	Diode, 1N457A	Sylvania 1N457A
CR201	025-034	Diode, 1N457A	Sylvania 1N457A
CR202	025-012	Diode, 1N277	Sylvania 1N277
CR203	025-034	Diode, 1N457A	Sylvania 1N457A
CR204	025-034	Diode, 1N457A	Sylvania 1N457A
CR205	025-034	Diode, 1N457A	Sylvania 1N457A
CR206	025-034	Diode, 1N457A	Sylvania 1N457A
CR301	025-034	Diode, 1N457A	Sylvania 1N457A
CR351	025-002	Diode, 1N82AG	Sylvania 1N82AG
CR401	025-016	Diode, HD5003	Hughes HD5003
CR451	025-034	Diode, 1N457A	Sylvania 1N457A
CR452	025-034	Diode, 1N457A	Sylvania 1N457A
CR453	025-034	Diode, 1N457A	Sylvania 1N457A
CR454	025-034	Diode, 1N457A	Sylvania 1N457A
CR501	025-028	Diode, 1N25	Sylvania 1N25
CR601	025-034	Diode, 1N457A	Sylvania 1N457A
CR602	025-034	Diode, 1N457A	Sylvania 1N457A
CR621	025-034	Diode, 1N457A	Sylvania 1N457A
CR622	025-034	Diode, 1N457A	Sylvania 1N457A
CR641	025-034	Diode, 1N457A	Sylvania 1N457A
CR642	025-034	Diode, 1N457A	Sylvania 1N457A
CR701	025-034	Diode, 1N457A	Sylvania 1N457A
CR702	025-034	Diode, 1N457A	Sylvania 1N457A
CR703	025-034	Diode, 1N457A	Sylvania 1N457A
CR704	025-034	Diode, 1N457A	Sylvania 1N457A

CIRCUIT REF. NO.	TEXSCAN STOCK NO.	DESCRIPTION	MFG., MFG. PART NO.
CR705	025-034	Diode, 1N457A	Sylvania 1N457A
CR706	025-034	Diode, 1N457A	Sylvania 1N457A
CR801	025-034	Diode, 1N457A	Sylvania 1N457A
CR802	025-034	Diode, 1N457A	Sylvania 1N457A
CV501	064-006	Varactor, 4pf	Texscan Corporation
CV502	064-006	Varactor, 4pf	Texscan Corporation
D1	025-018	Diode, Zener, 1N708,5.6V	Texas Instruments
D2	025-033	Diode, Zener, VR7A,7V	Sarkes Tarzian VR7A
D3	025-018	Diode, Zener, 1N708,5.6V	Texas Instruments
D4	025-033	Diode, Zener, VR7A,7V	Sarkes Tarzian VR7A
D5	025-033	Diode, Zener, VR7A,7V	Sarkes Tarzian VR7A
D6	025-011	Diode, Zener, ZA24B,24V	Mallory ZA24B
D7	025-033	Diode, Zener, VR7A,7V	Sarkes Tarzian VR7A
D101	025-009	Diode, Zener, ZA12B,12V	Mallory ZA12B
D102	025-033	Diode, Zener, VR7A,7V	Sarkes Tarzian VR7A
D201	025-025	Diode, Zener, ZA18B,18V	Mallory ZA18B
D202	025-024	Diode, Zener, VR28A,28V	Sarkes Tarzian VR28A
D451	025-038	Diode, Zener, ZA15B,15V	Mallory ZA15B
D452	025-038	Diode, Zener, ZA15B,15V	Mallory ZA15B
D453	025-024	Diode, Zener, VR28A,28V	Sarkes Tarzian VR28A
F1	034-001	Fuse, 1 Amp	Littlefuse 312001
I1	011-007	Bulb	Chicago Miniature CM-2181
I2	011-007	Bulb	Chicago Miniature CM-2181
I3	011-007	Bulb	Chicago Miniature CM-2181
I4	011-003	Bulb, 82V Regulator	Signalite Z82R10
I5	011-007	Bulb	Chicago Miniature CM-2181
I6	011-007	Bulb	Chicago Miniature CM-2181
IC451	062-027	Integrated Circuit, VA709C	Fairchild V5B-770939
IC452	062-027	Integrated Circuit, VS709C	Fairchild V5B-770939
J3-1	054-003	Socket, 6 Pins	Cinch 201-41-06-243

CIRCUIT REF. NO.	TEXSCAN STOCK NO.	DESCRIPTION	MFG., MFG. PART NO.
J302	054-003	Socket, 6 Pins	Cinch 201-41-06-243
J303	054-003	Socket, 6 Pins	Cinch 201-41-06-243
J304	054-003	Socket, 6 Pins	Cinch 201-41-06-243
J305	054-003	Socket, 6 Pins	Cinch 201-41-06-243
J306	054-003	Socket, 6 Pins	Cinch 201-41-06-243
J307	020-016	Connector, RF, 5069	Startronics 5069
J308	020-016	Connector, RF, 5069	Startronics 5069
J401	020-030	Connector, RF, UG185/U	Startronics UG185/U
J402	020-028	Connector, RF, UG1098/U	Startronics UG1098/U
J801	020-016	Connector, RF, 5069	Startronics 5069
J802	020-016	Connector, RF, 5069	Startronics 5069
J901	020-011	Connector, RF, UG625B/U	Startronics UG625B/U
J902	020-011	Connector, RF, UG625B/U	Startronics UG625B/U
J903	020-011	Connector, RF, UG625B/U	Startronics UG625B/U
J904	020-011	Connector, RF, UG625B/U	Startronics UG625B/U
J905	020-011	Connector, RF, UG625B/U	Startronics UG625B/U
L301	035-008	Inductor, 10mh	Central Coil H0813-15
L401*	A035-029	Factory Selected Value	Texscan Corporation
L402*	A035-029	Factory Selected Value	Texscan Corporation
L403*	A035-029	Factory Selected Value	Texscan Corporation
L404*	A035-029	Factory Selected Value	Texscan Corporation
L501*	A035-038-02	Factory Selected Value	Texscan Corporation
L502*	A035-038-02	Factory Selected Value	Texscan Corporation
L503*	A035-039	Factory Selected Value	Texscan Corporation
L505*	A035-038-02	Factory Selected Value	Texscan Corporation
L506*	A035-039	Factory Selected Value	Texscan Corporation
Q1	062-006	Transistor, 2N3054	RCA 2N3054
Q2	062-015	Transistor, 2N3568	Fairchild 2N3568
Q3	062-048	Transistor, 40362	RCA 40362
Q4	062-015	Transistor, 2N3568	Fairchild 2N3568
Q5	062-038	Transistor, 2N4900	Motorola 2N4900
Q6	062-008	Transistor, 2N3440	RCA 2N3440
Q7	062-015	Transistor, 2N3568	Fairchild 2N3568

CIRCUIT REF. NO.	TEXSCAN STOCK NO.	DESCRIPTION	MFG., MFG. PART NO.
Q8	062-021	Transistor, 2N3738	Motorola 2N3738
Q9	062-048	Transistor, 40362	RCA 40362
Q10	062-048	Transistor, 40362	RCA 40362
Q11	062-008	Transistor, 2N3440	RCA 2N3440
Q12	062-008	Transistor, 2N3440	RCA 2N3440
Q101	062-002	Transistor, 2N3565	Fairchild 2N3565
Q102	062-002	Transistor, 2N3565	Fairchild 2N3565
Q103	062-015	Transistor, 2N3568	Fairchild 2N3568
Q104	062-015	Transistor, 2N3568	Fairchild 2N3568
Q105	062-015	Transistor, 2N3568	Fairchild 2N3568
Q106	062-015	Transistor, 2N3568	Fairchild 2N3568
Q107	062-025	Transistor, 2N4360	Fairchild 2N4360
Q108	062-048	Transistor, 40362	RCA 40362
Q109	062-002	Transistor, 2N3565	Fairchild 2N3565
Q110	062-002	Transistor, 2N3565	Fairchild 2N3565
Q111	062-033	Transistor, VC714	Union Carbide UC714
Q112	062-022	Transistor, 2N3565	Fairchild 2N3565
Q113	062-015	Transistor, 2N3568	Fairchild 2N3568
Q114	062-022	Transistor, 2N3565	Fairchild 2N3565
Q201	062-048	Transistor, 40362	RCA 40362
Q202	062-048	Transistor, 40362	RCA 40362
Q203	062-048	Transistor, 40362	RCA 40362
Q204	062-033	Transistor, VC714	Union Carbide UC714
Q205	062-033	Transistor, VC714	Union Carbide UC714
Q206	062-015	Transistor, 2N3568	Fairchild 2N3568
Q207	062-015	Transistor, 2N3568	Fairchild 2N3568
Q208	062-015	Transistor, 2N3568	Fairchild 2N3568
Q209	062-015	Transistor, 2N3568	Fairchild 2N3568
Q210	062-015	Transistor, 2N3568	Fairchild 2N3568
Q211	062-025	Transistor, 2N4360	Fairchild 2N4360
Q212	062-015	Transistor, 2N3568	Fairchild 2N3568
Q213	062-005	Transistor, 2N3053	RCA 2N3053
Q301	062-024	Transistor, 2N3644	Fairchild 2N3644
Q302	062-024	Transistor, 2N3644	Fairchild 2N3644
Q303	062-024	Transistor, 2N3644	Fairchild 2N3644
Q304	062-024	Transistor, 2N3644	Fairchild 2N3644

CIRCUIT REF. NO.	TEXSCAN STOCK NO.	DESCRIPTION	MFG., MFG. PART NO.
Q305	062-024	Transistor, 2N3644	Fairchild 2N3644
Q306	062-024	Transistor, 2N3644	Fairchild 2N3644
Q401	062-029	Transistor	Texscan Corporation
Q402	062-029	Transistor	Texscan Corporation
Q403	062-029	Transistor	Texscan Corporation
Q404	062-031	Transistor	Texscan Corporation
Q451	062-008	Transistor, 2N3440	RCA 2N3440
Q452	062-008	Transistor, 2N3440	RCA 2N3440
Q453	062-008	Transistor, 2N3440	RCA 2N3440
Q454	062-048	Transistor, 40362	RCA 40362
Q455	062-048	Transistor, 40362	RCA 40362
Q456	062-015	Transistor, 2N3568	Fairchild 2N3568
Q457	062-015	Transistor, 2N3568	Fairchild 2N3568
Q458	062-048	Transistor, 40362	RCA 40362
Q459	062-048	Transistor, 40362	RCA 40362
Q460	062-025	Transistor, 2N3640	Fairchild 2N3640
Q501	062-032	Transistor	Texscan Corporation
Q502	062-032	Transistor	Texscan Corporation
Q503	062-044	Transistor, TD101	Sprague TD101
Q504	062-015	Transistor, 2N3568	Fairchild 2N3568
Q505	062-015	Transistor, 2N3568	Fairchild 2N3568
Q621	062-044	Transistor, TD101	Sprague TD101
Q623	062-015	Transistor, 2N3568	Fairchild 2N3568
Q624	062-015	Transistor, 2N3568	Fairchild 2N3568
Q641	062-044	Transistor, TD101	Sprague TD101
Q643	062-015	Transistor, 2N3568	Fairchild 2N3568
Q644	062-015	Transistor, 2N3568	Fairchild 2N3568
Q645	062-025	Transistor, 2N4360	Fairchild 2N4360
Q701	062-015	Transistor, 2N3568	Fairchild 2N3568
Q702	062-008	Transistor, 2N3440	RCA 2N3440
Q703	062-008	Transistor, 2N3440	RCA 2N3440
Q704	062-025	Transistor, 2N4360	Fairchild 2N4360
R1	046-354	Resistor, Fixed, 47 ohm, 1W, 10%	Allen Bradley
R2	046-142	Resistor, Fixed, 5.6K ohm, ½W, 10%	Allen Bradley
R3	046-124	Resistor, Fixed, 2.2K ohm, ½W, 10%	Allen Bradley

CIRCUIT REF. NO.	TEXSCAN STOCK NO.	DESCRIPTION	MFG., MFG. PART NO.
R4	047-075	Resistor,Fixed, 3 ohm,1W,1%	Sprague 242E-030-5
R5	047-075	Resistor,Fixed, 3 ohm,1W,1%	Sprague 242E-030-5
R6	046-117	Resistor,Fixed, 1.5K ohm,½W,10%	Allen Bradley
R7	046-142	Resistor,Fixed, 5.6K ohm,½W,10%	Allen Bradley
R8	048-030	Resistor,Variable, 1K ohm	CTS UPE200RE
R9	046-142	Resistor,Fixed, 1.5K ohm,½W,10%	Allen Bradley
R10	046-142	Resistor,Fixed, 1.5K ohm,½W,10%	Allen Bradley
R11	046-124	Resistor,Fixed, 2.2K ohm,½W,10%	Allen Bradley
R12	046-131	Resistor,Fixed, 3.3K ohm,½W,10%	Allen Bradley
R13	046-142	Resistor,Fixed, 5.6K ohm,½W,10%	Allen Bradley
R14	048-030	Resistor,Variable, 1K ohm	CTS UPE200RE
R15	046-117	Resistor,Fixed, 1.5K ohm,½W,10%	Allen Bradley
R16	046-180	Resistor,Fixed, 47K ohm,½W,10%	Allen Bradley
R17	046-463	Resistor,Fixed, 18K ohm,1W,10%	Allen Bradley
R18	046-166	Resistor,Fixed, 22K ohm,½W,10%	Allen Bradley
R19	046-086	Resistor,Fixed, 270 ohm,½W,10%	Allen Bradley
R20	046-180	Resistor,Fixed, 47K ohm,½W,10%	Allen Bradley
R21	046-479	Resistor,Fixed, 47K ohm,1W,5%	Allen Bradley
R22	048-026	Resistor,Variable, 25K ohm	CTS UPE200RE
R23	046-504	Resistor,Fixed, 180K ohm,1W,5%	Allen Bradley
R24	046-337	Resistor,Fixed, 18 ohm,1W,5%	Allen Bradley
R25	046-068	Resistor,Fixed, 100 ohm,½W,10%	Allen Bradley
R101	047-364	Resistor,Fixed, 15K ohm,½W,10%	IRC CEC-70
R102	047-364	Resistor,Fixed, 15K ohm,½W,10%	IRC CEC-70
R103	045-752	Resistor,Fixed, 10K ohm,¼W,10%	Allen Bradley
R104	045-780	Resistor,Fixed, 47K ohm,¼W,10%	Allen Bradley
R105	048-026	Resistor,Variable, 25K ohm	CTS UPE200RE
R106	045-759	Resistor,Fixed, 15K ohm,¼W,10%	Allen Bradley
R107	045-770	Resistor,Fixed, 27K ohm,¼W,10%	Allen Bradley
R108	048-026	Resistor,Variable, 25K ohm	CTS UPE200RE
R109	045-759	Resistor,Fixed, 15K ohm,¼W,10%	Allen Bradley
R110	045-819	Resistor,Fixed, 390K ohm,¼W,10%	Allen Bradley
R111	048-033	Resistor,Variable, 1.5M ohm	CTS UPE200RE
R112	045-749	Resistor,Fixed, 8.2K ohm,¼W,10%	Allen Bradley
R113	047-148	Resistor,Fixed, 1M ohm,½W,10%	Welwyn M12
R114	047-370	Resistor,Fixed, 33.2K ohm,½W,10%	IRC CECT-0

CIRCUIT REF. NO.	TEXSCAN STOCK NO.	DESCRIPTION	MFG., MFG. PART NO.
R115	047-360	Resistor,Fixed, 12.1K ohm,½W,10%	IRC CECT-0
R116	047-360	Resistor,Fixed, 12.1K ohm,½W,10%	IRC CECT-0
R117	047-360	Resistor,Fixed, 12.1K ohm,½W,10%	IRC CECT-0
R118	045-721	Resistor,Fixed, 1.8K ohm,¼W,10%	Allen Bradley
R119	045-731	Resistor,Fixed, 3.3K ohm,¼W,10%	Allen Bradley
R120	045-763	Resistor,Fixed, 18K ohm,¼W,10%	Allen Bradley
R121	045-763	Resistor,Fixed, 18K ohm,¼W,10%	Allen Bradley
R122	045-756	Resistor,Fixed, 12K ohm,¼W,10%	Allen Bradley
R123	045-759	Resistor,Fixed, 15K ohm,¼W,10%	Allen Bradley
R124	045-780	Resistor,Fixed, 47K ohm,¼W,10%	Allen Bradley
R125	045-756	Resistor,Fixed, 12K ohm,¼W,10%	Allen Bradley
R126	045-749	Resistor,Fixed, 8.2K ohm,¼W,10%	Allen Bradley
R127	045-756	Resistor,Fixed, 12K ohm,¼W,10%	Allen Bradley
R128	045-759	Resistor,Fixed, 15K ohm,¼W,10%	Allen Bradley
R129	045-770	Resistor,Fixed, 27K ohm,¼W,10%	Allen Bradley
R13	045-787	Resistor,Fixed, 68K ohm,¼W,10%	Allen Bradley
R131	045-794	Resistor,Fixed, 100K ohm,¼W,10%	Allen Bradley
R132	047-139	Resistor,Fixed, 110K ohm,½W,10%	IRC CECT-0
R133	048-121	Resistor,Variable, 25K ohm	Beckman 77PR25K
R134	047-069	Resistor,Fixed, 90.9K ohm,½W,10%	Texas Instruments CR1/2
R135	047-084	Resistor,Fixed, 3.75K ohm,½W,1%	Electra MF5C
R136	047-359	Resistor,Fixed, 3.32K ohm,½W,1%	IRC CECT-0
R137	045-794	Resistor,Fixed, 100K ohm,¼W,10%	Allen Bradley
R138	045-794	Resistor,Fixed, 100K ohm,¼W,10%	Allen Bradley
R139	045-780	Resistor,Fixed, 47K ohm,¼W,10%	Allen Bradley
R140	045-773	Resistor,Fixed, 33K ohm,¼W,10%	Allen Bradley
R141	045-787	Resistor,Fixed, 68K ohm,¼W,10%	Allen Bradley
R142	045-710	Resistor,Fixed, 1K ohm,¼W,10%	Allen Bradley
R143	045-784	Resistor,Fixed, 56 ohm,¼W,10%	Allen Bradley
R144	046-117	Resistor,Fixed, 1.5K,½W,10%	Allen Bradley
R145	048-120	Resistor,Variable, 2K ohm	Beckman 77PR2K
R146	046-124	Resistor,Fixed, 2.2K ohm,½W,10%	Allen Bradley
R147	045-766	Resistor,Fixed, 22K ohm,¼W,10%	Allen Bradley
R148	045-738	Resistor,Fixed, 4.7K ohm,¼W,10%	Allen Bradley
R149	045-805	Resistor,Fixed, 180K ohm,¼W,10%	Allen Bradley
R150	045-780	Resistor,Fixed, 47K ohm,¼W,10%	Allen Bradley

CIRCUIT REF. NO.	TEXSCAN STOCK NO.	DESCRIPTION	MFG., MFG. PART NO.
R151	045-731	Resistor,Fixed, 3.3K ohm,¼W,10%	Allen Bradley
R152	045-752	Resistor,Fixed, 10K ohm,¼W,10%	Allen Bradley
R153	048-027	Resistor,Variable, 100K ohm	CTS UPE200RE
R154	045-780	Resistor,Fixed, 47K ohm,¼W,10%	Allen Bradley
R155	045-742	Resistor,Fixed, 5.6K ohm,¼W,10%	Allen Bradley
R156	046-417	Resistor,Fixed, 1.5K ohm,1W,1%	Allen Bradley
R157	047-166	Resistor,Fixed, 10K ohm,½W,10%	IRC CECT-0
R158	045-731	Resistor,Fixed, 3.3K ohm,¼W,10%	Allen Bradley
R159	048-024	Resistor,Variable, 5K ohm	CTS UPE200RE
R160	045-749	Resistor,Fixed, 8.2K ohm,¼W,10%	Allen Bradley
R161	048-024	Resistor,Variable, 5K ohm	CTS UPE200RE
R162	045-731	Resistor,Fixed, 3.3K ohm,¼W,10%	Allen Bradley
R163	045-784	Resistor,Fixed, 56K ohm,¼W,10%	Allen Bradley
R164	045-749	Resistor,Fixed, 8.2K ohm,¼W,10%	Allen Bradley
R165	048-025	Resistor,Variable, 500K ohm	CTS UPE200RE
R166	045-780	Resistor,Fixed, 47K ohm,¼W,10%	Allen Bradley
R167	045-752	Resistor,Fixed, 10K ohm,¼W,10%	Allen Bradley
R168	045-752	Resistor,Fixed, 10K ohm,¼W,10%	Allen Bradley
R169	060-003	Resistor,Thermistor, 5K ohm	Fenwal JA35J1
R201	045-784	Resistor,Fixed, 100K ohm,¼W,10%	Allen Bradley
R202	048-097	Resistor,Variable, 50K ohm	Beckman 77PR50K
R203	047-203	Resistor,Fixed, 40.2K ohm,½W,10%	IRC CECT-0
R204	048-028	Resistor,Variable, 500K ohm	CTS UPE200RE
R205	048-028	Resistor,Variable, 500K ohm	CTS UPE200RE
R207	045-794	Resistor,Fixed, 100K ohm,¼W,10%	Allen Bradley
R208	048-097	Resistor,Variable, 50K ohm	Beckman 77PR50K
R209	048-028	Resistor,Variable, 500K ohm	CTS UPE200RE
R210	048-028	Resistor,Variable, 500K ohm	CTS UPE200RE
R211	045-766	Resistor,Fixed, 22K ohm,¼W,10%	Allen Bradley
R212	047-362	Resistor,Fixed, 2K ohm,2W,1%	IRC AS2
R213	048-096	Resistor,Variable, 500 ohm	Beckman 77PR500
R214	047-363	Resistor,Fixed, 2.7 ohm,2W,1%	IRC AS2
R215	047-363	Resistor,Fixed, 2.7 ohm,2W,1%	IRC AS2
R216	048-096	Resistor,Variable, 500 ohm	Beckman 77PR500
R217	047-362	Resistor,Fixed, 2K ohm,2W,1%	IRC AS2
R218	045-794	Resistor,Fixed, 100K ohm,¼W,10%	Allen Bradley

CIRCUIT REF. NO.	TEXSCAN STOCK NO.	DESCRIPTION	MFG., MFG. PART NO.
R219	046-403	Resistor,Fixed, 680 ohm,1W,10%	Allen Bradley
R220	045-710	Resistor,Fixed, 1K ohm,½W,10%	Allen Bradley
R221	047-364	Resistor,Fixed, 15K ohm,½W,1%	IRC CECT-0
R222	047-365	Resistor,Fixed, 1.21 ohm,½W,1%	IRC CECT-0
R223	045-752	Resistor,Fixed, 10K ohm,½W,10%	Allen Bradley
R224	045-696	Resistor,Fixed, 470 ohm,½W,10%	Allen Bradley
R225	047-364	Resistor,Fixed, 15K ohm,½W,10%	IRC CECT-0
R226	045-749	Resistor,Fixed, 8.2K ohm,½W,10%	Allen Bradley
R227	060-001	Resistor,Thermistor,1.2K ohm,5%	Texas Instruments TI1/4
R228	045-724	Resistor,Fixed, 2.2K ohm,½W,10%	Allen Bradley
R229	045-857	Resistor,Fixed, 3.3M ohm,½W,10%	Allen Bradley
R230	045-857	Resistor,Fixed, 3.3M ohm,½W,10%	Allen Bradley
R231	047-066	Resistor,Fixed, 1K ohm,½W,1%	Texas Instruments CR1/2
R232	045-696	Resistor,Fixed, 470 ohm,½W,10%	Allen Bradley
R233	045-749	Resistor,Fixed, 8.2K ohm,½W,10%	Allen Bradley
R234	045-724	Resistor,Fixed, 2.2K ohm,½W,10%	Allen Bradley
R235	045-857	Resistor,Fixed, 3.3M ohm,½W,10%	Allen Bradley
R236	045-857	Resistor,Fixed, 3.3M ohm,½W,10%	Allen Bradley
R237	047-066	Resistor,Fixed, 1K ohm,½W,1%	Texas Instruments CR1/2
R238	045-731	Resistor,Fixed, 3.3 ohm,½W,10%	Allen Bradley
R239	045-787	Resistor,Fixed, 68K ohm,½W,10%	Allen Bradley
R240	045-780	Resistor,Fixed, 47K ohm,½W,10%	Allen Bradley
R241	045-752	Resistor,Fixed, 10K ohm,½W,10%	Allen Bradley
R242	045-780	Resistor,Fixed, 47K ohm,½W,10%	Allen Bradley
R243	045-780	Resistor,Fixed, 47K ohm,½W,10%	Allen Bradley
R244	045-812	Resistor,Fixed, 270K ohm,½W,10%	Allen Bradley
R245	045-752	Resistor,Fixed, 10K ohm,½W,10%	Allen Bradley
R246	045-703	Resistor,Fixed, 680 ohm,½W,10%	Allen Bradley
R247	045-812	Resistor,Fixed, 270K ohm,½W,10%	Allen Bradley
R248	045-815	Resistor,Fixed, 330K ohm,½W,10%	Allen Bradley
R249	045-756	Resistor,Fixed, 12K ohm,½W,10%	Allen Bradley
R250	045-780	Resistor,Fixed, 47K ohm,½W,10%	Allen Bradley
R251	045-696	Resistor,Fixed, 470 ohm,½W,10%	Allen Bradley
R252	045-668	Resistor,Fixed, 100 ohm,½W,10%	Allen Bradley
R253	045-780	Resistor,Fixed, 47K ohm,½W,10%	Allen Bradley
R254	045-756	Resistor,Fixed, 12K ohm,½W,10%	Allen Bradley

CIRCUIT REF. NO.	TEXSCAN STOCK NO.	DESCRIPTION	MFG., MFG. PART NO.
R255	045-752	Resistor,Fixed, 10K ohm,½W,10%	Allen Bradley
R301	048-025	Resistor,Variable, 10K ohm	CTS UPE200RE
R302	048-025	Resistor,Variable, 10K ohm	CTS UPE200RE
R303	048-025	Resistor,Variable, 10K ohm	CTS UPE200RE
R304	048-025	Resistor,Variable, 10K ohm	CTS UPE200RE
R305	048-025	Resistor,Variable, 10K ohm	CTS UPE200RE
R306	045-710	Resistor,Fixed, 1K ohm,½W,10%	Allen Bradley
R307	045-710	Resistor,Fixed, 1K ohm,½W,10%	Allen Bradley
R308	045-710	Resistor,Fixed, 1K ohm,½W,10%	Allen Bradley
R309	045-710	Resistor,Fixed, 1K ohm,½W,10%	Allen Bradley
R310	045-710	Resistor,Fixed, 1K ohm,½W,10%	Allen Bradley
R311	045-710	Resistor,Fixed, 1K ohm,½W,10%	Allen Bradley
R312	045-710	Resistor,Fixed, 1K ohm,½W,10%	Allen Bradley
R313	045-752	Resistor,Fixed, 10K ohm,½W,10%	Allen Bradley
R314	045-808	Resistor,Fixed, 220K ohm,½W,10%	Allen Bradley
R315	045-668	Resistor,Fixed, 100 ohm,½W,10%	Allen Bradley
R316	045-808	Resistor,Fixed, 220K ohm,½W,10%	Allen Bradley
R317	045-668	Resistor,Fixed, 100 ohm,½W,10%	Allen Bradley
R318	045-808	Resistor,Fixed, 220K ohm,½W,10%	Allen Bradley
R319	045-668	Resistor,Fixed, 100 ohm,½W,10%	Allen Bradley
R320	045-808	Resistor,Fixed, 220K ohm,½W,10%	Allen Bradley
R321	045-752	Resistor,Fixed, 10K ohm,½W,10%	Allen Bradley
R322	045-680	Resistor,Fixed, 330 ohm,½W,10%	Allen Bradley
R323	045-752	Resistor,Fixed, 10K ohm,½W,10%	Allen Bradley
R324	045-752	Resistor,Fixed, 10K ohm,½W,10%	Allen Bradley
R325	048-026	Resistor,Variable, 25K ohm	CTS UPE200RE
R326	045-836	Resistor,Fixed, 1M ohm,½W,10%	Allen Bradley
R327	048-130	Resistor,Variable, 100K/100K	Texscan Corporation
R328	045-815	Resistor,Fixed, 330K ohm,½W,10%	Allen Bradley
R329	046-180	Resistor,Fixed, 47K ohm,½W,10%	Allen Bradley
R330	045-752	Resistor,Fixed, 10K ohm,½W,10%	Allen Bradley
R331	045-836	Resistor,Fixed, 1M ohm,½W,10%	Allen Bradley
R332	048-131	Resistor,Variable, 10K ohm	CTS Series 550
R333	045-805	Resistor,Fixed, 720K ohm,½W,10%	Allen Bradley
R334	045-752	Resistor,Fixed, 10K ohm,½W,10%	Allen Bradley
R335	045-680	Resistor,Fixed, 330 ohm,½W,10%	Allen Bradley

CIRCUIT REF. NO.	TEXSCAN STOCK NO.	DESCRIPTION	MFG., MFG. PART NO.
R351	045-682	Resistor,Fixed, 220 ohm,¼W,10%	Allen Bradley
R352	045-752	Resistor,Fixed, 10K ohm,¼W,10%	Allen Bradley
R353	045-658	Resistor,Fixed, 56 ohm,¼W,10%	Allen Bradley
R354	045-658	Resistor,Fixed, 56 ohm,¼W,10%	Allen Bradley
R355	045-696	Resistor,Fixed, 470 ohm,¼W,10%	Allen Bradley
R356	045-672	Resistor,Fixed, 120 ohm,¼W,10%	Allen Bradley
R357	045-668	Resistor,Fixed, 100 ohm,¼W,10%	Allen Bradley
R358	045-672	Resistor,Fixed, 120 ohm,¼W,10%	Allen Bradley
R401	045-717	Resistor,Fixed, 1.5K ohm,¼W,10%	Allen Bradley
R402	045-752	Resistor,Fixed, 10K ohm,¼W,10%	Allen Bradley
R403	045-640	Resistor,Fixed, 220 ohm,¼W,10%	Allen Bradley
R404	045-654	Resistor,Fixed, 47 ohm,¼W,10%	Allen Bradley
R405	046-051	Resistor,Fixed, 39 ohm,¼W,10%	Allen Bradley
R406	045-749	Resistor,Fixed, 8.2K ohm,¼W,10%	Allen Bradley
R407	045-640	Resistor,Fixed, 220 ohm,¼W,10%	Allen Bradley
R408	045-647	Resistor,Fixed, 33 ohm,¼W,10%	Allen Bradley
R409	045-703	Resistor,Fixed, 680 ohm,¼W,10%	Allen Bradley
R411	045-654	Resistor,Fixed, 47 ohm,¼W,10%	Allen Bradley
R412	046-056	Resistor,Fixed, 51 ohm,¼W,10%	Allen Bradley
R413	045-647	Resistor,Fixed, 33 ohm,¼W,10%	Allen Bradley
R414	045-668	Resistor,Fixed, 100 ohm,¼W,10%	Allen Bradley
R415	045-728	Resistor,Fixed, 2.7K ohm,¼W,10%	Allen Bradley
R416	045-693	Resistor,Fixed, 390 ohm,¼W,10%	Allen Bradley
R417	045-647	Resistor,Fixed, 33 ohm,¼W,10%	Allen Bradley
R418	046-040	Resistor,Fixed, 18 ohm,¼W,10%	Allen Bradley
R419	045-745	Resistor,Fixed, 6.8K ohm,¼W,10%	Allen Bradley
R420	045-612	Resistor,Fixed, 4.7 ohm,¼W,10%	Allen Bradley
R421	045-728	Resistor,Fixed, 2.7K ohm,¼W,10%	Allen Bradley
R422	045-654	Resistor,Fixed, 47 ohm,¼W,10%	Allen Bradley
R423	045-626	Resistor,Fixed, 10 ohm,¼W,10%	Allen Bradley
R424	045-752	Resistor,Fixed, 10K ohm,¼W,10%	Allen Bradley
R425	045-747	Resistor,Fixed, 7.5K ohm,¼W,10%	Allen Bradley
R426	045-630	Resistor,Fixed, 12 ohm,¼W,10%	Allen Bradley
R427	046-38[illegible]	Resistor,Fixed, 270 ohm,1W,10%	Allen Bradley
R428	045-626	Resistor,Fixed, 10 ohm,¼W,10%	Allen Bradley
R429	045-640	Resistor,Fixed, 22 ohm,¼W,10%	Allen Bradley

CIRCUIT REF. NO.	TEXSCAN STOCK NO.	DESCRIPTION	MFG., MFG. PART NO.
R430	045-612	Resistor,Fixed, 4.7 ohm,¼W,10%	Allen Bradley
R431	045-626	Resistor,Fixed, 10 ohm,¼W,10%	Allen Bradley
R432	046-682	Resistor,Fixed, 220 ohm,2W,10%	Allen Bradley
R433	045-682	Resistor,Fixed, 220 ohm,¼W,10%	Allen Bradley
R434		Factory Selected Value	
R435	045-693	Resistor,Fixed, 390 ohm,¼W,10%	Allen Bradley
R436	045-710	Resistor,Fixed, 1K ohm,¼W,10%	Allen Bradley
R451	045-647	Resistor,Fixed, 33 ohm,¼W,10%	Allen Bradley
R452	045-759	Resistor,Fixed, 15K ohm,¼W,10%	Allen Bradley
R453	045-665	Resistor,Fixed, 82 ohm,¼W,10%	Allen Bradley
R454	045-703	Resistor,Fixed, 680 ohm,¼W,10%	Allen Bradley
R455	045-791	Resistor,Fixed, 82K ohm,¼W,10%	Allen Bradley
R456	045-763	Resistor,Fixed, 18K ohm,¼W,10%	Allen Bradley
R457	045-794	Resistor,Fixed, 100K ohm,¼W,10%	Allen Bradley
R458	045-752	Resistor,Fixed, 10K ohm,¼W,10%	Allen Bradley
R459	045-724	Resistor,Fixed, 2.2K ohm,¼W,10%	Allen Bradley
R460	045-738	Resistor,Fixed, 4.7K ohm,¼W,10%	Allen Bradley
R461	045-738	Resistor,Fixed, 4.7K ohm,¼W,10%	Allen Bradley
R462	045-749	Resistor,Fixed, 8.2K ohm,¼W,10%	Allen Bradley
R463	045-766	Resistor,Fixed, 22K ohm,¼W,10%	Allen Bradley
R464	045-763	Resistor,Fixed, 18K ohm,¼W,10%	Allen Bradley
R465	045-763	Resistor,Fixed, 18K ohm,¼W,10%	Allen Bradley
R466	045-815	Resistor,Fixed, 330K ohm,¼W,10%	Allen Bradley
R467	045-815	Resistor,Fixed, 330K ohm,¼W,10%	Allen Bradley
R468	048-031	Resistor,Variable, 200K ohm	CTS 200RS
R469	048-032	Resistor,Variable, 1M ohm	CTS UPE200RE
R470	045-763	Resistor,Fixed, 18K ohm,¼W,10%	Allen Bradley
R471	046-403	Resistor,Fixed, 680 ohm,¼W,10%	Allen Bradley
R472	046-403	Resistor,Fixed, 680 ohm,¼W,10%	Allen Bradley
R473	045-759	Resistor,Fixed, 15K ohm,¼W,10%	Allen Bradley
R474	045-749	Resistor,Fixed, 5.6K ohm,¼W,10%	Allen Bradley
R475	045-756	Resistor,Fixed, 12K ohm,¼W,10%	Allen Bradley
R476	045-808	Resistor,Fixed, 220K ohm,¼W,10%	Allen Bradley
R477	045-766	Resistor,Fixed, 22K ohm,¼W,10%	Allen Bradley
R478	045-696	Resistor,Fixed, 470 ohm,¼W,10%	Allen Bradley
R479	048-122	Resistor,Variable, 5K ohm	Beckman 77PR5K

CIRCUIT REF. NO.	TEXSCAN STOCK NO.	DESCRIPTION	MFG., MFG. PART NO.
R480	045-696	Resistor,Fixed, 470 ohm,¼W,10%	Allen Bradley
R481	045-759	Resistor,Fixed, 15K ohm,¼W,10%	Allen Bradley
R482	048-123	Resistor,Variable, 20K ohm	Beckman 77PR20K
R483	045-749	Resistor,Fixed, 8.2K ohm,¼W,10%	Allen Bradley
R484	045-770	Resistor,Fixed, 27K ohm,¼W,10%	Allen Bradley
R485	045-721	Resistor,Fixed, 1.8K ohm,¼W,10%	Allen Bradley
R486	045-700	Resistor,Fixed, 560 ohm,¼W,10%	Allen Bradley
R487	045-791	Resistor,Fixed, 82K ohm,¼W,10%	Allen Bradley
R488	045-752	Resistor,Fixed, 10K ohm,¼W,10%	Allen Bradley
R489	045-794	Resistor,Fixed, 100K ohm,¼W,10%	Allen Bradley
R490	045-682	Resistor,Fixed, 220 ohm,¼W,10%	Allen Bradley
R491	045-752	Resistor,Fixed, 10K ohm,¼W,10%	Allen Bradley
R492	048-122	Resistor,Variable, 5K ohm	Beckman 77PR5K
R493	045-801	Resistor,Fixed, 150K ohm,¼W,10%	Allen Bradley
R494	045-763	Resistor,Fixed, 18K ohm,¼W,10%	Allen Bradley
R501	045-759	Resistor,Fixed, 15K ohm,¼W,10%	Allen Bradley
R502	045-745	Resistor,Fixed, 6.8K ohm,¼W,10%	Allen Bradley
R503	045-654	Resistor,Fixed, 47 ohm,¼W,10%	Allen Bradley
R504	045-466	Resistor,Fixed, 22K ohm,¼W,10%	Allen Bradley
R505	045-658	Resistor,Fixed, 56 ohm,¼W,10%	Allen Bradley
R506	045-759	Resistor,Fixed, 15K ohm,¼W,10%	Allen Bradley
R507	045-745	Resistor,Fixed, 6.8K ohm,¼W,10%	Allen Bradley
R508	045-654	Resistor,Fixed, 47 ohm,¼W,10%	Allen Bradley
R509	045-466	Resistor,Fixed, 22K ohm,¼W,10%	Allen Bradley
R510	045-658	Resistor,Fixed, 56 ohm,¼W,10%	Allen Bradley
R511	045-696	Resistor,Fixed, 470 ohm,¼W,10%	Allen Bradley
R512*		Factory Selected Value	
R513	045-626	Resistor,Fixed, 10 ohm,¼W,10%	Allen Bradley
R601	045-836	Resistor,Fixed, 1M ohm,¼W,10%	Allen Bradley
R602	045-773	Resistor,Fixed, 33K ohm,¼W,10%	Allen Bradley
R603	047-166	Resistor,Fixed, 10K ohm,¼W,1%	IRC CECT-0
R604	047-360	Resistor,Fixed, 12.1K ohm,¼W,1%	IRC CECT-0
R605	045-773	Resistor,Fixed, 33K ohm,¼W,10%	Allen Bradley
R606	045-836	Resistor,Fixed, 1M ohm,¼W,10%	Allen Bradley
R607	045-721	Resistor,Fixed, 1.8K ohm,¼W,10%	Allen Bradley
R608	045-731	Resistor,Fixed, 3.3K ohm,¼W,10%	Allen Bradley
R609	045-763	Resistor,Fixed, 18K ohm,¼W,10%	Allen Bradley

CIRCUIT REF. NO.	TEXSCAN STOCK NO.	DESCRIPTION	MFG., MFG. PART NO.
R610	045-763	Resistor,Fixed, 18K ohm,½W,10%	Allen Bradley
R611	045-756	Resistor,Fixed, 12K ohm,½W,10%	Allen Bradley
R612	045-752	Resistor,Fixed, 10K ohm,½W,10%	Allen Bradley
R613	047-388	Resistor,Fixed, 1K ohm,½W,1%	IRC CECT-0
R614	048-122	Resistor,Variable, 5K ohm	Beckman 77PR5K
R615	048-122	Resistor,Variable, 5K ohm	Beckman 77PR5K
R616	047-381	Resistor,Fixed, 4.7K ohm,½W,1%	IRC CECT-0
R621	045-836	Resistor,Fixed, 1M ohm,½W,10%	Allen Bradley
R622	045-773	Resistor,Fixed, 33K ohm,½W,10%	Allen Bradley
R623	047-166	Resistor,Fixed, 10K ohm,½W,10%	IRC CECT-0
R624	047-360	Resistor,Fixed, 12.1K ohm,½W,1%	IRC CECT-0
R625	045-773	Resistor,Fixed, 33K ohm,½W,10%	Allen Bradley
R626	045-836	Resistor,Fixed, 1M ohm,½W,10%	Allen Bradley
R627	045-721	Resistor,Fixed, 1.8K ohm,½W,10%	Allen Bradley
R628	045-731	Resistor,Fixed, 3.3K ohm,½W,10%	Allen Bradley
R629	045-763	Resistor,Fixed, 18K ohm,½W,10%	Allen Bradley
R630	045-763	Resistor,Fixed, 18K ohm,½W,10%	Allen Bradley
R631	045-756	Resistor,Fixed, 12K ohm,½W,10%	Allen Bradley
R632	045-752	Resistor,Fixed, 10K ohm,½W,10%	Allen Bradley
R633	047-388	Resistor,Fixed, 1K ohm,½W,1%	IRC CECT-0
R634	048-122	Resistor,Variable, 5K ohm	Beckman 77PR5K
R635	048-122	Resistor,Variable, 5K ohm	Beckman 77PR5K
R636	047-081	Resistor,Fixed, 4.7K ohm,½W,1%	IRC CECT-0
R641	045-836	Resistor,Fixed, 1M ohm,½W,10%	Allen Bradley
R642	045-773	Resistor,Fixed, 33K ohm,½W,10%	Allen Bradley
R643	047-166	Resistor,Fixed, 10K ohm,½W,1%	IRC CECT-0
R644	047-360	Resistor,Fixed, 12.1K ohm,½W,1%	IRC CECT-0
R645	045-773	Resistor,Fixed, 33K ohm,½W,10%	Allen Bradley
R646	045-882	Resistor,Fixed, 470K ohm,½W,10%	Allen Bradley
R647	045-721	Resistor,Fixed, 1.8K ohm,½W,10%	Allen Bradley
R648	045-731	Resistor,Fixed, 3.3K ohm,½W,10%	Allen Bradley
R649	045-763	Resistor,Fixed, 18K ohm,½W,10%	Allen Bradley
R650	045-763	Resistor,Fixed, 18K ohm,½W,10%	Allen Bradley
R651	045-756	Resistor,Fixed, 12K ohm,½W,10%	Allen Bradley
R652	045-729	Resistor,Fixed, 2.7K ohm,½W,10%	Allen Bradley
R653	045-742	Resistor,Fixed, 5.6K ohm,½W,10%	Allen Bradley
R654	047-388	Resistor,Fixed, 1K ohm,½W,1%	IRC CECT-0

CIRCUIT REF. NO.	TEXSCAN STOCK NO.	DESCRIPTION	MFG., MFG. PART NO.
R655	048-122	Resistor,Variable, 5K ohm	Beckman 77PR5K
R656	048-122	Resistor,Variable, 5K ohm	Beckman 77PR5K
R657	047-081	Resistor,Fixed, 4.7K ohm,½W,1%	IRC CECT-0
R658	045-794	Resistor,Fixed, 100K ohm,½W,10%	Allen Bradley
R659	045-752	Resistor,Fixed, 10K ohm,½W,10%	Allen Bradley
R660	045-836	Resistor,Fixed, 1M ohm,½W,10%	Allen Bradley
R661	045-738	Resistor,Fixed, 4.7K ohm,½W,10%	Allen Bradley
R662	045-738	Resistor,Fixed, 4.7K ohm,½W,10%	Allen Bradley
R663	045-728	Resistor,Fixed, 2.7K ohm,½W,10%	Allen Bradley
R664	045-728	Resistor,Fixed, 2.7K ohm,½W,10%	Allen Bradley
R665	045-728	Resistor,Fixed, 2.7K ohm,½W,10%	Allen Bradley
R701	048-027	Resistor,Variable, 100K ohm	CTS UPE200RE
R702	048-027	Resistor,Variable, 100K ohm	CTS UPE200RE
R703	048-026	Resistor,Variable, 25K ohm	CTS UPE200RE
R704	048-027	Resistor,Variable, 100K ohm	CTS UPE200RE
R705	048-025	Resistor,Variable, 10K ohm	CTS UPE200RE
R706	048-031	Resistor,Variable, 200K ohm	CTS UPE200RE
R707	045-794	Resistor,Fixed, 100K ohm,½W,10%	Allen Bradley
R708	046-477	Resistor,Fixed, 39K ohm,1W,10%	Allen Bradley
R709	046-477	Resistor,Fixed, 39K ohm,1W,10%	Allen Bradley
R710	045-791	Resistor,Fixed, 82K ohm,½W,10%	Allen Bradley
R711	048-025	Resistor,Variable, 10K ohm	CTS UPE200RE
R712	048-031	Resistor,Variable, 200K ohm	CTS UPE200RE
R713	048-026	Resistor,Variable, 25K ohm	CTS UPE200RE
R714	048-027	Resistor,Variable, 100K ohm	CTS UPE200RE
R715	048-027	Resistor,Variable, 100K ohm	CTS UPE200RE
R716	048-027	Resistor,Variable, 100K ohm	CTS UPE200RE
R717	048-023	Resistor,Variable, 2K ohm	CTS UPE200RE
R718	045-731	Resistor,Fixed, 3.3K ohm,½W,10%	Allen Bradley
R719	048-023	Resistor,Variable, 2K ohm	CTS UPE200RE
R720	045-703	Resistor,Fixed, 680 ohm,½W,10%	Allen Bradley
R721	045-703	Resistor,Fixed, 680 ohm,½W,10%	Allen Bradley
R722	045-743	Resistor,Fixed, 6.8K ohm,½W,10%	Allen Bradley
R723	048-024	Resistor,Variable, 5K ohm	CTS UPE200RE
R724	048-023	Resistor,Variable, 2K ohm	CTS UPE200RE
R725	048-030	Resistor,Variable, 1K ohm	CTS UPE200RE
R726	045-693	Resistor,Fixed, 390 ohm,½W,10%	Allen Bradley

REF. NO.	STOCK NO.		
R727	045-714	Resistor,Fixed, 1.2K ohm,¼W,10%	Allen Bradley
R728	045-735	Resistor,Fixed, 3.9K ohm,¼W,10%	Allen Bradley
R730	048-024	Resistor,Variable, 5K ohm	CTS UPE200RE
R731	045-710	Resistor,Fixed, 1K ohm,¼W,10%	Allen Bradley
R732	045-836	Resistor,Fixed, 1M ohm,¼W,10%	Allen Bradley
R733	045-723	Resistor,Fixed, 2.2K ohm,¼W,10%	Allen Bradley
R734	045-808	Resistor,Fixed, 220K ohm,¼W,10%	Allen Bradley
R735	045-714	Resistor,Fixed, 1.2K ohm,¼W,10%	Allen Bradley
R736	045-717	Resistor,Fixed, 1.5K ohm,¼W,10%	Allen Bradley
R737	045-735	Resistor,Fixed, 3.9K ohm,¼W,10%	Allen Bradley
R738	048-022	Resistor,Variable, 500 ohm	CTS UPE200RE
R739	045-714	Resistor,Fixed, 1.2K ohm,¼W,10%	Allen Bradley
R740	045-665	Resistor,Fixed, 82 ohm,¼W,10%	Allen Bradley
R801	057-061	Switch, SPST/50K ohm	Texscan Corporation
R802	045-798	Resistor,Fixed, 120K ohm,¼W,10%	Allen Bradley
R804	057-055	Switch, 4P4T / 100K ohm	Texscan Corporation
R805	045-780	Resistor,Fixed, 47K ohm,¼W,10%	Allen Bradley
R807	046-100	Resistor,Fixed, 560 ohm,½W,10%	Allen Bradley
R808	048-131	Resistor,Variable, 10K ohm	Texscan Corporation
R809	048-129	Resistor,Variable, 250K ohm,100K ohm	Texscan Corporation
R810	048-129	Resistor,Variable, 250K ohm,100K ohm	Texscan Corporation
R811	048-128	Resistor,Variable, 200K ohm, 10 Turn	Bourns 3501S-1-204
R812	048-128	Resistor,Variable, 200K ohm, 10 Turn	Bourns 3501S-1-204
R813	048-081	Resistor,Variable, 1M ohm	CTS RU5LAYSB105B
R814	048-081	Resistor,Variable, 1M ohm	CTS RU5LAYSB105B
R815	048-127	Resistor,Variable, 2K ohm, 10 Turn	Bourns 3500S-2-202
R816	045-764	Resistor,Fixed, 20K ohm,¼W,5%	Allen Bradley
R817	048-126	Resistor,Variable, 10K ohm, 10 Turn	Bourns 3500S-103
R818	045-665	Resistor,Fixed, 82 ohm,¼W,10%	Allen Bradley
R819	046-103	Resistor,Fixed, 680 ohm,½W,10%	Allen Bradley
R901	048-026	Resistor,Variable, 5K ohm	CTS UPE200RE
R902	048-034	Resistor,Variable, 250 ohm	CTS UPE200RE
S1	057-061	Switch, SPST/50K ohm	Texscan Corporation
S2	057-031	Switch, Slide, DPDT	Continental Wirt
S201	057-003	Switch, Slide, DPDT	Continental Wirt G12
S202	057-003	Switch, Slide, DPDT	Continental Wirt G12

CIRCUIT REF. NO.	TEXSCAN STOCK NO.	DESCRIPTION	MFG., MFG. PART NO.
S301	057-056	Switch, 16P2T	Texscan Corporation
S302	057-056	Switch, 16P2T	Texscan Corporation
S303	057-056	Switch, 16P2T	Texscan Corporation
S304	057-056	Switch, 16P2T	Texscan Corporation
S305	057-056	Switch, 16P2T	Texscan Corporation
S306	057-056	Switch, 16P2T	Texscan Corporation
S307	057-056	Switch, 16P2T	Texscan Corporation
S308	057-056	Switch, 16P2T	Texscan Corporation
S804	057-055	Switch, 4P4T/100K ohm	Texscan Corporation
S805	057-054	Switch, 12P6T	Texscan Corporation
S806	057-058	Switch, 2P2T	Texscan Corporation
S807	057-057	Switch, 2P2T	Texscan Corporation
S808	057-060	Switch, 4P2T	Texscan Corporation
S809	057-060	Switch, 4P2T	Texscan Corporation
S810	057-059	Switch, 6P2T	Texscan Corporation
S811	057-059	Switch, 6P2T	Texscan Corporation
S812	057-059	Switch, 6P2T	Texscan Corporation
S813	057-052	Switch, 12P3T	Texscan Corporation
T1	061-013	Transformer	American Magnetics AM3052
Z201	077-001	Relay, Reed, 6V	Magnecraft WID4EPX-2

CAUTION:

Units shipped from the factory are identified for operation from the proper input power source. Note the following:

(1) 230-volt rms, 50/60 Hz, single-phase power source.

A RED label marked "230V" is wrapped around the power cord within six inches (15 cm) of the polarized power plug. A RED label marked "230V" is also attached to the rear panel of the unit above the line-cord grommet.

(2) 115 volt rms, 50/60 Hz, single-phase power source.

A YELLOW label marked "115V" is wrapped around the power cord within six inches (15 cm) of the polarized power plug. A YELLOW label marked "115V" is also attached to the rear panel of the unit above the line-cord grommet.

Damage to any unit which is connected to a 230-volt power source, but which is wired internally for 115-volt operation constitutes "misuse", and is not covered by the TEXSCAN warranty. Consult the TEXSCAN instruction manual for the proper internal power-source connection if there is any question about the intended use. NOTE: The line fuse(s) must also be checked for the correct rating and type.

CONDITIONS OF SALE

Determination of prices, terms, conditions of sale, and final acceptance of orders are made only at our plant in Indianapolis, Indiana.

All prices are F.O.B. Indianapolis, Indiana, USA.

Terms in the United States and Canada are Net 30 days if credit has been arranged.

Terms throughout the rest of the free world are arranged with Texscan's area representative.

SERVICE AND PARTS

Repair service is available at our plant in Indianapolis, Indiana. Before returning an instrument for repair, please write to us, requesting a Returned Material Authorization. On receipt of shipping authorization, forward the instrument prepaid. Care should be taken in packing the instrument to insure protection in transit. Also, state the type and serial number of the instrument, date of purchase, and details concerning the difficulty.

Repair parts may be ordered from our home plant or through our sales representatives. When ordering repair parts, please specify the part number and description of the item, and the type and serial number of the instrument in which it is used.

TEXSCAN RECOMMENDS FACTORY REPAIR OF RF CIRCUITS

If failure occurs in an RF section of any TEXSCAN test instrument, TEXSCAN recommends that the complete instrument be returned to the factory for repair and calibration. Replacement of an RF assembly or component may result in failure of the instrument to meet its published specifications and failure to perform within its design capabilities. TEXSCAN Customer Service personnel are experienced in the repair and calibration of the complete line of TEXSCAN test instruments. When practical, updated improvements can be included in the repaired instrument.

SPECIFICATION CHANGES

The right is reserved to change the published specifications of equipment at any time, and to furnish merchandise in accordance with current specifications without incurring any liability to modify equipment previously sold.

WARRANTY

Products manufactured by Texscan Corporation are warranted against defective materials and workmanship for one year from date of shipment. Any instrument or component which has been found to be defective during this one-year period will be repaired or replaced without charge except for vacuum tubes or batteries which have given normal service. No other warranty is expressed or implied.

ORDERING INFORMATION

In the United States and Canada, please order through your local representative or directly with the factory. Your factory trained representative can supply technical data and latest price and delivery quotations.

The factory address is:

Texscan Corporation
2446 North Shadeland Avenue
Indianapolis, Indiana 46219
Phone: 317-357-8781
TWX: 810-341-3184
Cable Address: TEXSCAN

In Western Europe, please order through your local representative, who can supply technical assistance and up-to-date price and delivery information.

Complete addresses and telephone numbers of Texscan's sales representatives are listed on the outside back cover of the catalogue.

SHIPPING INSTRUCTIONS

Unless specific instructions accompany the order, we shall use our own judgment as to the best method of shipment. Unless otherwise specified, normal shipments will be by air freight or air express. Small items are sent via parcel post. The listed price for our products include the packing, but does not include the cost of shipping.

IMPORTANT!

WARRANTY AND SERVICE INFORMATION

Products manufactured by TEXSCAN CORPORATION are warranted, to the original purchaser, against defective material and workmanship for a period of one year from the original date of shipment from our plant. This warranty is limited to the replacement or repair of components or parts found defective within this one-year period, including the labor involved in their replacement, when the product is returned, shipping charges prepaid, to our factory in Indianapolis, Indiana. It does not apply to normal service items, such as batteries, tubes or appearance items which have given normal service, nor does it apply to damage caused by abuse, misuse, mishandling, or damage caushed by shipment, unauthorized modification, repair or attempted repair. In fulfilling this warranty, TEXSCAN'S liability is limited to the repair of this product. The company assumes no liability for any consequential damage.

In the event that you experience difficulty with this unit, please write Customer Service Dept., TEXSCAN CORP., 2446 N. Shadeland Avenue, Indianapolis, Indiana 46219, or call (317) 357-8781. If return of this unit to TEXSCAN is authorized, you will be given a Repair Authorization number, which must be marked on the outside of the shipping container. Enclose the additional information requested below and forward the unit, shipping charges prepaid, to TEXSCAN. All service work is FOB our plant in Indianapolis, Indiana.

Overseas customers should contact our local sales representatives.

Service is also available, at nominal cost, for older TEXSCAN products. Please follow the same procedure described in the preceding paragraph, even though you are requesting non-warranty repairs. Not only will you help expedite the unit to Customer Service, but you will also have established your priority.

All units handled by our Customer Service Dept. are carefully re-inspected by our Quality Assurance Dept. to ensure that they function in accordance with the specifications which were applicable at the time of their manufacture. We reserve the right to make product improvements and changes, without incurring any liability to modify equipment previously sold. However, we do occasionally find it more expedient to update portions of older models rather than attempt repairs.

Should you desire to perform repairs in your own facility, approved replacement parts may be purchased through our Customer Service Dept. Please order by TEXSCAN part number and specify the model and serial number of the instrument in which it is to be used.

REPAIR AUTHORIZATION NO._____ DATE_____ YOUR P.O.NO._____

TYPE OF EQUIPMENT_____ MODEL_____

SERIAL NUMBER_____ DATE OF PURCHASE_____

OWNER'S NAME & ADDRESS_____

FOR FURTHER INFORMATION, CONTACT_____

DESCRIPTION OF PROBLEM_____

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